86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 812

DISPOSITION OF SUNDRY PAPERS

AUGUST 10, 1959.—Ordered to be printed

Mr. THOMPSON of New Jersey, from the Joint Committee on Disposition of Executive Papers, submitted the following

REPORT

[Pursuant to 59 Stat. 434 and 63 Stat. 377]

The joint select committee of the Senate and House of Representatives, appointed on the part of the Senate and House of Representatives and acting in compliance with the provisions of the act approved July 7, 1943 (57 Stat. 380), as amended by the act approved July 6, 1945 (59 Stat. 434), and the act approved June 30, 1949 (63 Stat. 377), respectfully reports to the Senate and House of Representatives that it has received and examined the report of the Archivist of the United States No. 60–2, dated July 30, 1959, to the 86th Congress, 1st session, ubmitting the following lists or schedules covering records proposed sfr disposal by the Government agencies indicated:

Job No.	Agency by which submitted	Job No.	Agency by which submitted
II-NNA-3051...	Housing and Home Finance Agency.	II-NNA-3067...	Department of State.
II-NNA-3056...	Department o. State.	II-NNA-3068...	Department of the Air Force.
II-NNA-3057...	Department of Commerce.	II-NNA-3069...	Department of Justice.
II-NNA-3059...	U.S. Atomic Energy Commission.	II-NNA-3070...	Department of the Air Force.
II-NNA-3060...	Department o. Labor	II-NNA-3074...	General Services Administration.
II-NNA-3062...	Department of the Treasury.	III-NIR-308...	Do.
II-NNA-3065...	Department of the Air Force.	III-NIR-312...	Do.
II-NNA-3066...	Department of the Treasury.	III-NRD-285...	Do.
		III-NWR-308...	Do

Your committee reports that the records proposed for disposal in the said lists or schedules reported by the Archivist of the United States do not, or will not after the lapse of the period specified, have sufficient administrative, legal, research, or other value to warrant their continued preservation by the Government and recommends that their disposal be accomplished subject to the proviso of section 6 and the provisions of section 9 of the aforementioned act, as amended.

59015°—59 H. Rept., 86–1, vol. 5——57

Respectfully submitted to the Senate and House of Representatives.

FRANK THOMPSON, Jr.,
WILLARD S. CURTIN,
Members on the Part of the House.

OLIN D. JOHNSTON,
FRANK CARLSON,
Members of the Part of the Senate.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 813

MODIFYING CITIZENSHIP REQUIREMENTS FOR U.S. SHIPPING CORPORATIONS

AUGUST 10, 1959.—Referred to the House Calendar and ordered to be printed

Mr. BONNER, from the Committee on Merchant Marine and Fisheries, submitted the following

REPORT

[To accompany H.R. 6888]

The Committee on Merchant Marine and Fisheries, to whom was referred the bill (H.R. 6888) to amend section 4132 of the Revised Statutes, section 37 of the Merchant Marine Act, 1920, and section 2 of the Shipping Act, 1916, having considered the same, report favorably thereon with amendments and recommend that the bill as amended do pass.

The amendments are as follows:

Strike out of line 1 through 4, of page 2, the words—

> the president shall be a citizen of the United States and such number of its directors shall be citizens of the United States as will at any meeting of the board of directors, a quorum being present, be a majority of the directors present—

and insert in lieu thereof the words—

> the president or other chief executive officer and the chairman of the board of directors shall be citizens of the United States and no more of its directors than a minority of the number necessary to constitute a quorum shall be noncitizens,

Strike out of lines 13 through 17, of page 2, the words—

> its president is a citizen of the United States and such number of its directors are citizens of the United States as will at any meeting of the board of directors, a quorum being present, be a majority of the directors present—

and insert in lieu thereof the words—

> its president or other chief executive officer and the chairman of its board of directors are citizens of the United States and unless no more of its directors than a minority of the number necessary to constitute a quorum are noncitizens.

Insert at the end of the bill a new section 4, to read as follows:

> SEC. 4. Section 905(c) of the Merchant Marine Act, 1936, as amended, is amended by striking out the words "section 2 of the Shipping Act, 1916, as amended (U.S.C., title 46, sec. 802)," and inserting in lieu thereof the words "section 2 of the Shipping Act, 1916, as amended (U.S.C., title 46, sec. 802), and with respect to a corporation under title VI of this Act, all directors of the corporation are citizens of the United States".

PURPOSE OF THE BILL

The purpose of the bill is to change the definition of "citizen of the United States" in section 2 of the Shipping Act, 1916, so as to include in that definition (if the stock ownership requirements of sec. 2 are met) corporations organized under the laws of the United States, or any States thereof, which have some alien directors, but not so many that a meeting of the board of directors could be held without a majority of the directors present being citizens of the United States. The bill also would amend the documentation laws to allow vessels owned by such corporations to be documented.

NEED FOR THE LEGISLATION

Under existing law one of the requirements for U.S. citizenship within the meaning of section 2 of the Shipping Act, 1916, is that the president and managing directors of the corporation be citizens of the United States.

The documentation laws (sec. 4132 of the Revised Statutes, 46 U.S.C. 11) which are administered by the Bureau of Customs, Department of the Treasury, provide that a vessel owned by a corporation organized in the United States, or any State thereof, whose president and managing directors are citizens of the United States, can be documented.

In construing section 2 of the Shipping Act, 1916, the Maritime Administration holds that the term "managing director" includes any director, irrespective of whether or not he is an officer, member of the executive committee, or otherwise takes any part in the day-to-day management of corporate affairs. Thus, in the view of the Maritime Administration, a corporation with even one alien director may not, without the consent of the Maritime Administration, enter into a contract to build a vessel in the United States, accept delivery of a vessel, charter a vessel, mortgage a vessel, or other things necessary to the ownership and operation of a fleet of ships under the American flag. On the other hand, the Bureau of Customs construes the term "managing director" in the narrower sense of applying only to a director actively participating in the day-to-day administration of a corporation. Consequently, as a result of such conflicting rulings, a corporation can be in the anomalous position of being recognized as a citizen for the purpose of documentation of a vessel, but not for the purpose of building, buying, or chartering a vessel to be documented.

This bill would eliminate from the statutes the words which have received such contrary interpretation, and would substitute therefor a definition of corporate citizen which is clear and unambiguous and

will result in consistent application by the branches of the Government charged with the administration of the shipping laws. At the same time, however, it does not permit such a citizen corporation to become subject to alien management and therefore does not depart from the original intent that American shipping corporations should be under American citizen control.

The existing law affects several large railroads, oil companies, and industrial companies which operate vessels as an incident to their main business, and which, because they have one or more alien directors, are classed by the Maritime Administration as noncitizens of the United States. In addition to the hardship worked on American corporations owning and operating ships, one of the largest sources of private financing of vessel construction is made unavailable from participating in the the financing of American-flag vessels. For an example, the Metropolitan Life Insurance Co., which has engaged actively in the financing of foreign-flag vessels, is not a "citizen of the United States" under existing law as construed by the Maritime Administration because it has one director serving on its board of directors who is a citizen of Canada. The anomalous effect of existing law is well expressed in the following paragraph from a letter of June 17, 1959, from the Metropolitan Life Insurance Co. to the chairman of your committee.

> Assuming the Maritime Administration's construction of such provisions is correct, Metropolitan cannot, without prior approval of the Maritime Administration, accept directly from any borrower, as security for a loan or investment made by Metropolitan, a mortgage on any American-flag vessel or an assignment of a charter party covering the employment of such a vessel. Even if the Maritime Administration should approve such a mortgage to Metropolitan, the mortgage could not constitute a preferred ship mortgage under the Ship Mortgage Act (46 U.S.C. 922(a)(5)) so as to entitle Metropolitan, as a mortgagee, to the priorities and remedy available under that act in respect of a preferred ship mortgage. Nor is it clear under the applicable provision of that act (46 U.S.C. 961(e)) that Metropolitan could purchase such a vessel in any mortgage foreclosure proceeding in order to protect its loan even if the Maritime Administration were willing to approve such purchase.
>
> If H.R. 6888 is enacted into law, Metropolitan will qualify as a "citizen of the United States" under the provisions of the acts to be amended by the bill. In the light of our experience as presently advised, we believe that legislation of the general nature proposed by H.R. 6888 would facilitate financing in this field and in our opinion such legislation would be in the public interest and should not thwart the basic purposes of such statutes.

Another undesirable effect of the existing law was pointed out to your committee. That is, that American shipping corporations are barred from availing themselves of the abilities and experience of executives of foreign nationality who might make major contributions as directors of the American corporations. And as pointed out in the report of the Department of State:

> Enactment of H.R. 6888 would coincide with U.S. interest in encouraging and protecting private foreign investment, since foreign representation in American corporations can be a factor in demonstrating the community of interest in foreign and American capital in developing trade and commerce to the full advantage of the United States and friendly foreign countries.

In view of all the foregoing, your committee believes that this bill is necessary and urges its enactment.

THE AMENDMENTS

The Maritime Administrator pointed out that in sections 1 and 3 of the bill where provision is made—

> that one of the requirements of a citizen corporation would be that such number of its directors are citizens of the United States as will at any meeting of the board of directors, a quorum being present, be a majority of the directors present—

might be subject to misconstruction. He suggested that this could possibly be construed as requiring that only such number of directors must be citizens as would be a majority of a quorum.

To avoid any such interpretation, the bill has been amended to clarify the intent and to provide that the president or other chief executive officer and the chairman of the board of directors shall be citizens of the United States and no more of its directors than a minority of the number necessary to constitute a quorum shall be noncitizens.

The Maritime Administrator further testified that he did not believe that provisions of the bill permitting a minor number of aliens on a shipping corporation's board of directors should be extended to operators holding an operating-differential subsidy contract under title VI of the Merchant Marine Act of 1936. Your committee concurs with the Maritime Administrator and the bill is amended in accordance with his recommendation.

COST OF THE LEGISLATION

The bill by its nature involves no question of cost to the Federal Government.

The departmental reports on H.R. 6888 follow:

THE SECRETARY OF COMMERCE,
Washington, D.C., July 23, 1959.

Hon. HERBERT C. BONNER,
Chairman, Committee on Merchant Marine and Fisheries,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: This letter is in reply to your request of May 6, 1959, for the views of this Department with respect to H.R. 6888, a bill to amend section 4132 of the Revised Statutes, section 37 of the Merchant Marine Act, 1920, and section 2 of the Shipping Act, 1916.

The purpose of the bill is to change the definition of "citizen of the United States" in section 2 of the Shipping Act, 1916, so as to include

in that definition (if the stock ownership requirements of sec. 2 are met) corporations organized under the laws of the United States, or any State thereof, who have some alien directors, but not so many alien directors that a lawful meeting of the board of directors could be held without a majority of the directors present being citizens of the United States; and to make changes in the documentation laws to allow vessels owned such corporations to be documented.

The Department of Commerce has no objection to enactment of the bill if the bill is amended as hereinafter proposed.

The practical effect of the bill would be to allow vessels owned by citizens of the United States (or by corporations organized under the laws of the United States, or any State thereof) to be transferred, mortgaged, leased, or chartered to such corporations with alien directors without the consent of the Secretary of Commerce, and to make such corporations eligible for aid under the Merchant Marine Act, 1936.

Under existing law several large railroads, oil companies, and industrial companies which operate vessels as an incident to their main business are classed, by the Maritime Administration, under section 2 of the 1916 act, as noncitizens of the United States because they have one or more alien directors. These directors are usually Canadians or Englishmen. These corporations have not for this reason been disqualified as transferees of vessels covered by the 1916 act, because the Maritime Administration has in each case consented to the transfer of the vessels. Some such corporations, however, would evidently prefer not to be classified as noncitizens of the United States.

The documentation laws (sec. 4132 of the Revised Statutes, 46 U.S.C. 11) which are administered by the Bureau of Customs, Department of the Treasury, provide that a vessel owned by a corporation organized in the United States, or any State thereof, whose president and managing directors are citizens of the United States, can be documented. Our understanding is that the Bureau of Customs under existing law will document a vessel owned by a corporation with some alien directors if a committee of the board of directors consisting only of citizens of the United States is designated as the managing directors of the maritime affairs of the corporation.

Section 27 of the Merchant Marine Act, 1920 (which is also administered by the Bureau of Customs, Department of the Treasury), prohibits the transportation by water between points in the United States embraced within the coastwise laws in any other vessel than a vessel built in the United States, documented under the laws of the United States, and owned by citizens of the United States as defined in section 2 of the Shipping Act, 1916.

One of the requirements for U.S. citizenship under section 2 of the Shipping Act, 1916, is that the president and managing directors of the corporation be citizens of the United States. Our understanding is that in the administration of section 27 of the Merchant Marine Act, 1920, the Bureau of Customs considers this portion of the citizenship requirement satisfied if a corporation with alien directors creates a committee of its board of directors consisting only of citizens of the United States, which it designates as the managing directors of the maritime affairs of the corporation.

Sections 9 and 37 of the Shipping Act, 1916 (which are administered by the Maritime Administration, Department of Commerce), prohibit

the transfer, mortgage, lease, or charter of vessels covered by the act to persons not citizens of the United States without the consent of the Secretary of Commerce. In the administration of these sections, the Maritime Administration considers any corporation which has an alien director to be a noncitizen of the United States, because it considers all the directors of the corporation to be the managers of the corporation.

We think that the intent of the bill is to limit the number of alien directors of a citizen corporation so that at any meeting of the board of directors which is attended by all of the alien directors, and at which a quorum of the board is present, a majority of the directors present would be citizens of the United States. This would limit the number of alien directors to a number not exceeding one-half the number of directors required for a quorum.

The language of the bill, however, might possibly be susceptible of a different interpretation. The bill provides that one of the requirements of a citizen corporation would be that "such number of its directors are citizens of the United States as will at any meeting of the board of directors, a quorum being present, be a majority of the directors present." This could possibly be construed as requiring that only such number of directors need be citizens as would be a majority of a quorum; so that if there were 15 directors, for example, and a quorum under the corporation charter or bylaws was 7, then only 4 directors need be citizens of the United States.

We recommend, therefore, that (to clarify the language) the bill be amended by striking out of line 1 through 4 and line 14 through 17 of page 2 the words "and such number of its directors shall be citizens of the United States as will at any meeting of the board of directors, a quorum being present, be a majority of the directors present" and inserting in lieu thereof the words "and no more of its directors than one-half the number necessary to constitute a quorum are not citizens of the United States".

The Department considers that with this amendment the provisions of the bill would be an adequate safeguard with respect to the citizenship of directors of unsubsidized operators. The Department does not, however, believe that these provisions should be extended to operators who hold an operating-differential subsidy contract under title VI of the Merchant Marine Act, 1936.

The Department therefore recommends that the bill be amended by inserting at the end thereof a new section 4 to read as follows:

"SEC. 4. Section 905(c) of the Merchant Marine Act, 1936, as amended, is amended by striking out the words 'section 2 of the Shipping Act, 1916, as amended (U.S.C. title 46, sec. 802),' and inserting in lieu thereof the words 'section 2 of the Shipping Act, 1916, as amended (U.S.C. title 46, sec. 802), and with respect to a corporation under title VI of this Act, all directors of the corporation are citizens of the United States' ".

So amended, this Department does not object to favorable consideration of the bill.

The Bureau of the Budget has advised that there would be no objection to the submission of this report to your committee.

Sincerely yours,

F. H. MUELLER,
Acting Secretary of Commerce.

COMPTROLLER GENERAL OF THE UNITED STATES,
Washington, May 29, 1959.

Hon. HERBERT C. BONNER,
Chairman, Committee on Merchant Marine and Fisheries,
House of Representatives.

DEAR MR. CHAIRMAN: Further reference is made to your letter of May 6, 1959, acknowledged on May 7, requesting the comments of the General Accounting Office concerning H.R. 6888, 86th Congress, 1st session, entitled "A bill to amend section 4132 of the Revised Statutes, section 37 of the Merchant Marine Act, 1920, and section 2 of the Shipping Act, 1916."

We have no special information or knowledge as to the need for or desirability of the proposed legislation and, therefore, we make no recommendation with respect to its enactment. However, we should like to call attention to the fact that since both the 1936 act and the Merchant Ship Sales Act of 1946 provide that "citizens of the United States" includes a corporation "* * * only if it is a citizen of the United States within the meaning of section 2 of the Shipping Act, 1916 * * *," consideration may be desired regarding the effect of the present amendment upon those acts.

Sincerely yours,

JOSEPH CAMPBELL,
Comptroller General of the United States.

TREASURY DEPARTMENT,
Washington, July 21, 1959.

Hon. HERBERT C. BONNER,
Chairman, Committee on Merchant Marine and Fisheries, Room 219,
House Office Building, Washington, D.C.

MY DEAR MR. CHAIRMAN: I have your letter of May 6, 1959, requesting a statement of this Department's views and recommendations on H.R. 6888, a bill to amend section 4132 of the Revised Statutes, section 37 of the Merchant Marine Act, 1920, and section 2 of the Shipping Act, 1916.

The bill would substitute for the present requirement that all managing directors be citizens of the United States in the case of a corporation owning and operating vessels under the navigation laws administered by this Department, and for the purposes of the laws relating to shipping administered by the Maritime Administration of the Department of Commerce, a requirement that a majority of the corporate directors attending any board meeting at which a quorum is present shall be citizens.

For the reasons stated in the attached memorandum, the Treasury Department favors the principle espoused by the proposed legislation. However, it questions the workability of the bill as written and suggests the consideration of certain basic considerations keyed to the navigation laws with which this Department is concerned.

The Department has been advised by the Bureau of the Budget that there is no objection to the submission of this report to your committee.

Very truly yours,

(Signed) A. GILMORE FLUES,
Acting Secretary of the Treasury.

MEMORANDUM ACCOMPANYING THE REPORT ON H.R. 6888, A BILL TO AMEND SECTION 4132 OF THE REVISED STATUTES, SECTION 37 OF THE MERCHANT MARINE ACT, 1920, AND SECTION 2 OF THE SHIPPING ACT, 1916

The basic documentation statute contained in section 4132 of the Revised Statutes (46 (U.S.C. 11), as well as section 2 of the Shipping Act, 1916 (46 U.S.C. 802), and section 37 of the Merchant Marine Act, 1920 (46 U.S.C. 888), which define a corporate citizen for the general purposes of the Merchant Marine Acts require, among other things, that all managing directors of a corporate vessel owner be citizens.

The bill would substitute the requirement that only such number of directors, whether managing directors or not, shall be citizens as will constitute a majority of the directors present at any meeting of the board which has a quorum present.

Speaking to the citizenship requirements for the documentation of vessels of the United States which are administered by the Bureau of Customs, the Treasury Department recognizes the need for clarification of the status of managing directors. The designation "managing" has its roots in the organization of corporate entities in vogue in England over a hundred years ago. American corporations, so far as can be ascertained, did not adopt the English practice of designating directors as managing or otherwise. Therefore, insofar as corporate owners of documented vessels were concerned, the corporations were burdened with a concept of citizen director control of vessel activities not applicable to corporate owners of other forms of transportation. This has given rise to confusion in which administrative interpretation has largely provided the guiding principles.

As far as the Bureau of Customs and its predecessors were concerned, in the absence of a specific designation of managing directors, all members of the board were considered to be managing directors. Obviously, this has permitted the creation of managing directors through the medium of corporate bylaws, such specially devised seats on the board being limited to citizens. The bill as written is a step in the right direction, but does not accomplish all that might be desired.

Modern methods of financing corporate ventures, coupled with the current desire to attract foreign capital which often involves the grant of one or more seats on the board of directors to persons other than citizens of the United States, is a fact that must be faced squarely. In the interest of the orderly and efficient conduct of corporate business there is much to be said for the removal of all citizen-director requirements. This approach is bolstered by the fact that directors normally vote the desires of the stockholders to whom they are responsible for their places on the board, whether they are citizens or aliens. Therefore, it would seem certainly as far as the Treasury Department's jurisdiction is concerned, that the requirement for a majority stock ownership by citizens for general vessel operation and a three-fourths ownership by citizens for operation in the coastwise trade, thus insuring for all practical purposes, a 51-percent and 75-percent citizenship representation, respectively, on the board of directors, plus the further requirement for statutory organization under domestic law and the prohibition against transfer of a vessel to foreign

ownership or flag without Government sanction, are persuasive arguments for removal of all citizen-director requirements.

Of course, if a percentage of citizen membership on the board of directors is desired as a matter of legislative policy, the Department would not object to a requirement that the citizenship of directors follow the percentages already established for stock ownership. However, even this is no guarantee that all vessel business of the corporation will be conducted according to the views of the citizen stockholders and really adds little, if anything, to the control of corporations by the United States. It is entirely possible for the citizen directors constituting the majority of the board to split into groups, one or more of which may be allied with the view of the alien directors and thus prevail. Furthermore, such an alliance of views would not constitute the type of alien domination condemned by statutes forbidding an alien interest in the ownership and operation of American vessels, whether by way of trust, confidence, or otherwise. (See 46 U.S.C. 19, 41, and 802(b).)

The issue is clearly one for congressional decision on grounds of legislative policy in view of the many statutes affected. The Treasury Department is not in a position to deal with all of the matters involved. However, speaking to the Department's administration of the navigation laws relating to the documentation and operation of vessels, with particular reference to avoiding troublesome problems of administration, the Department would give first preference to the removal of all citizen-director requirements and a secondary preference to a requirement that the citizenship of directors follow the percentages already established for stock ownership.

No suggestion is made at this time for specific amendatory language since this must necessarily await the development of legislative policy. However, the Department will be glad to cooperate with any drafting group designated by the legislative branch and to make available such technical assistance as may be desired.

DEPARTMENT OF THE NAVY,
OFFICE OF THE SECRETARY,
Washington, D.C., July 23, 1959.

Hon. HERBERT C. BONNER,
Chairman, Committee on Merchant Marine and Fisheries, House of Representatives, Washington, D.C.

MY DEAR MR. CHAIRMAN: Your request for comment on H.R. 6888, a bill to amend section 4132 of the Revised Statutes, section 37 of the Merchant Marine Act, 1920, and section 2 of the Shipping Act, 1916, has been assigned to this Department by the Secretary of Defense for the preparation of a report thereon expressing the views of the Department of Defense.

This bill would amend existing law so that U.S. shipping lines, accorded certain benefits under such law, may have aliens on their boards of directors. The bill provides, however, that the boards of directors must consist of enough members of U.S. citizenship to assure that such citizens will be in the majority at any meeting wherein a quorum is present.

As enactment of this legislation would have no direct effect on this Department, the Department of the Navy, on behalf of the Depart-

ment of Defense, neither supports nor opposes enactment of H.R. 6888 but defers to the views of those executive agencies having primary interest therein.

This report has been coordinated within the Department of Defense in accordance with procedures prescribed by the Secretary of Defense.

The Department of the Navy has been advised by the Bureau of the Budget that there is no objection to the submission of this report on H.R. 6888 to the Congress.

Sincerely yours,

JOHN S. MCCAIN, Jr.,
Rear Admiral, U.S. Navy,
Chief of Legislative Affairs
(For the Secretary of the Navy).

DEPARTMENT OF STATE,
Washington, July 22, 1959.

Hon. HERBERT C. BONNER,
Chairman, Committee on Merchant Marine and Fisheries,
House of Representatives.

DEAR MR. BONNER: I refer again to your letter of May 6, 1959, inviting the views and recommendations of the Department of State on H.R. 6888, a bill to amend section 4132 of the Revised Statutes, section 37 of the Merchant Marine Act, 1920, and section 2 of the Shipping Act, 1916. Interim acknowledgment of your letter was made on May 7, 1959.

H.R. 6888 would amend the Shipping Act, 1916, and other statutes, to allow membership by noncitizens on the board of directors of a U.S. citizen corporation, as defined in that act, so long as such membership constitutes a minority at any meeting of the board.

While the proposed legislation applies primarily to domestic matters, the Department of State believes that enactment of this bill would further foreign policy objectives of the United States, and avoid difficulties which have arisen in the past as a result of the strict requirements of existing law. The enactment of H.R. 6888 would coincide with U.S. interests in encouraging and protecting private foreign investment, since foreign representation in American corporations can be a factor in demonstrating the community of interest in foreign and American capital in developing trade and commerce to the full advantage of the United States and friendly foreign countries.

For the above reasons, the Department of State favors the enactment of H.R. 6888.

The Department has been informed by the Bureau of the Budget that there is no objection to the submission of this report.

Sincerely yours,

WILLIAM B. MACOMBER, Jr.,
Assistant Secretary
(For the Acting Secretary of State).

CHANGES IN EXISTING LAW

In compliance with clause 3 of rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill, as introduced, are shown as follows (existing law proposed to be omitted is

enclosed in black brackets, new matter is printed in italic, existing law in which no change is proposed is shown in roman):

SECTION 4132 OF THE REVISED STATUTES, AS AMENDED (46 U.S.C. 11)

SEC. 4132. Vessels built within the United States and belonging wholly to citizens thereof; and vessels which may be captured in war by citizens of the United States and lawfully condemned as prize, or which may be adjudged to be forfeited for a breach of the laws of the United States; and seagoing vessels, whether steam or sail, which have been certified by the Bureau of Marine Inspection and Navigation [1] as safe to carry dry and perishable cargo, wherever built, which are to engage only in trade with foreign countries, with the Philippine Islands, the Islands of Guam, Tutuila, Wake, Midway, and Kingman Reef, being wholly owned by citizens of the United States [or corporations organized and chartered under the laws of the United States, or of any State thereof, the president and managing directors of which shall be citizens of the United States], *or corporations organized and chartered under the laws of the United States, or of any State thereof, of which the president shall be a citizen of the United States and such number of its directors shall be citizens of the United States as will at any meeting of the board of directors, a quorum being present, be a majority of the directors present* and no others, may be registered as directed in this title. Foreign-built vessels registered pursuant to this Act shall not engage in the coastwise trade: *Provided*, That a foreign-built yacht, pleasure boat, or vessel not used or intended to be used for trade admitted to American registry pursuant to this section shall not be exempt from the collection of ad valorem duty provided in section thirty-seven of the Act approved August fifth, nineteen hundred and nine, entitled "An Act to provide revenue, equalize duties, and encourage the industries of the United States, and for other purposes." *Provided further*, That such vessels so admitted under the provisions of this section may contract with the Postmaster General under the Act of March third, eighteen hundred and ninety-one, entitled "An Act to provide for ocean mail service between the United States and foreign ports, and to promote commerce," so long as such vessels shall in all respects comply with the provisions and requirements of said Act.

SECTION 37 OF THE MERCHANT MARINE ACT, 1920 (41 STAT. 1008)

SEC. 37. That when used in this Act, unless the context otherwise requires, the terms "person," "vessel," "documented under the laws of the United States," and "citizen of the United States" shall have the meaning assigned to them by sections 1 and 2 of the "Shipping Act, 1916," as amended [by this Act]; the term "board" means the United States Shipping Board;[2] and the term "alien" means any person not a citizen of the United States.

[1] The functions of the Bureau of Marine Inspection and Navigation were transferred to the Coast Guard on authority of 1946 Reorganization Plan No. 3.

[2] The functions of the United States Shipping Board were transferred to the Department of Commerce and the United States Shipping Board was abolished by Executive Order No. 6166, June 10, 1933. These same functions were then transferred to the United States Maritime Commission by sections 204(a) and 904 of the Merchant Marine Act, 1936 (49 Stat. 1987 and 2016). The functions of the United States Maritime Commission were transferred to the Federal Maritime Board and the Secretary of Commerce on authority of 1950 Reorganization Plan No. 21. The United States Maritime Commission was abolished on authority of 1950 Reorganization Plan No. 21.

SECTION 2 OF THE SHIPPING ACT OF 1916, AS AMENDED (46 U.S.C. 802)

SEC. 2. (a) That within the meaning of this chapter no corporation, partnership, or association shall be deemed a citizen of the United States unless the controlling interest therein is owned by citizens of the United States, and [in the case of a corporation, unless its president and managing directors are citizens of the United States] *in the case of a corporation, unless its president is a citizen of the United States and such number of its directors are citizens of the United States as will at any meeting of the board of directors, a quorum being present, be a majority of the directors present,* and the corporation itself is organized under the laws of the United States or of a State, Territory, District, or possession thereof, but in the case of a corporation, association, or partnership operating any vessel in the coastwise trade the amount of interest required to be owned by citizens of the United States shall be 75 per centum.

(b) The controlling interest in a corporation shall not be deemed to be owned by citizens of the United States (a) if the title to a majority of the stock thereof is not vested in such citizens free from any trust or fiduciary obligation in favor of any person not a citizen of the United States; or (b) if the majority of the voting power in such corporation is not vested in citizens of the United States; or (c) if through any contract or understanding it is so arranged that the majority of the voting power may be exercised, directly or indirectly, in behalf of any person who is not a citizen of the United States; or, (d) if by any other means whatsoever control of the corporation is conferred upon or permitted to be exercised by any person who is not a citizen of the United States.

(c) Seventy-five per centum of the interest in a corporation shall not be deemed to be owned by citizens of the United States (a) if the title to 75 per centum of its stock is not vested in such citizens free from any trust or fiduciary obligation in favor of any person not a citizen of the United States; or (b) if 75 per centum of the voting power in such corporation is not vested in citizens of the United States; or (c) if, through any contract or understanding, it is so arranged that more than 25 per centum of the voting power in such corporation may be exercised, directly or indirectly, in behalf of any person who is not a citizen of the United States; or (d) if by any other means whatsoever control of any interest in the corporation in excess of 25 per centum is conferred upon or permitted to be exercised by any person who is not a citizen of the United States.

(d) The provisions of this Act shall apply to receivers and trustees of all persons to whom the Act applies, and to the successors or assignees of such persons.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 814

AUTHORIZING AND DIRECTING THE SURGEON GENERAL OF THE PUBLIC HEALTH SERVICE TO MAKE A STUDY AND REPORT TO CONGRESS, FROM THE STANDPOINT OF THE PUBLIC HEALTH, OF THE DISCHARGE OF SUBSTANCES INTO THE ATMOSPHERE FROM THE EXHAUSTS OF MOTOR VEHICLES

AUGUST 10, 1959.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. ROBERTS, from the Committee on Interstate and Foreign Commerce, submitted the following

REPORT

[To accompany H.R. 8238]

The Committee on Interstate and Foreign Commerce, to whom was referred the bill (H.R. 8238) to prohibit the introduction into commerce of new motor vehicles which discharge substances in amounts found by the Surgeon General of the Public Health Service to be dangerous to human health, having considered the same, report favorably thereon with amendments and recommend that the bill do pass.

The amendments are as follows:

Strike out all after the enacting clause and insert the following:

That the Surgeon General of the Public Health Service (hereinafter referred to as the "Surgeon General") shall conduct a thorough study for the purpose of determining, with respect to the various substances discharged from the exhausts of motor vehicles, the amounts and kinds of such substances which, from the standpoint of human health, it is safe for motor vehicles to discharge into the atmosphere under the various conditions under which such vehicles may operate.

SEC. 2. As soon as practicable, but not later than two years after the date of the enactment of this Act, the Surgeon General shall submit to Congress a report on the results of the study conducted pursuant to the first section of this Act together with such recommendations, if any, based upon the findings made in such study, as he may deem to be necessary for the protection of the public health.

SEC. 3. As used in this Act the term "motor vehicles" means vehicles propelled by mechanical power and used for transporting passengers or property on a highway.

Amend the title of the bill to read:

A bill to authorize and direct the Surgeon General of the Public Health Service to make a study and report to Congress, from the standpoint of the public health, of the discharge of substances into the atmosphere from the exhausts of motor vehicles.

PURPOSE OF THE LEGISLATION

The purpose of this legislation, as amended by the committee, is to direct the Surgeon General of the Public Health Service to conduct a study of the effect on human health of substances discharged into the atmosphere by the exhausts of motor vehicles.

The Surgeon General would be required to submit a report to Congress within 2 years, with such recommendations, if any, he deems necessary to protect human health.

HISTORY OF THE LEGISLATION

Air pollution is a national problem. It is a public health problem. Federal, State, and local governments have spent vast sums to study and control this problem. Industry likewise has spent millions on research and abatement. Great progress has been made but the problem is far from solved. In fact, the blight of air pollution, especially resulting from automotive exhaust gases, has become a real menace to all urban areas.

This problem has been under consideration by the Committee on Interstate and Foreign Commerce for many years. In 1955, your committee reported favorably on legislation for Federal aid in air-pollution control. This legislation (Public Law 159, 84th Cong.) directs the Public Health Service to conduct and support research and to provide technical services to State and local governments and to private agencies. The law provides for a 5-year program and authorized total expenditures of $25 million.

In 1956, the Special Subcommittee on Traffic Safety of this committee made a study of noxious, toxic, and harmful motor vehicle exhaust fumes in connection with a comprehensive investigation of highway traffic safety. Testimony was taken and research activities of the industry were studied on visits to manufacturing plants.

The danger to automobile drivers and occupants resulting from exposure to exhaust fumes in traffic was called forcefully to the attention of the Traffic Safety Subcommittee in the 1956 hearings at Dayton, Ohio, by Dr. Robert E. Zipf, president of the Ohio State Coroner's Association, who urged that a research program be set up to study this problem (hearings, "Traffic Safety, 1956," p. 722).

Legislation proposed to provide standards

After consideration of the data gathered in the subcommittee study, Congressman Schenck on July 20, 1957, introduced H.R. 9368, 85th Congress, to prohibit the use in commerce of any motor vehicle which discharged unburned hydrocarbons in an amount found by the Surgeon General to be dangerous to human health.

That bill directed the Surgeon General of the Public Health Service to prescribe and publish, not later than 6 months after enactment of the legislation, standards as to the amount of unburned hydrocarbons

which are safe, from the standpoint of human health (with particular reference to the carcinogenic nature of unburned hydrocarbons), for a motor vehicle to discharge into the atmosphere.

The bill provided criminal penalties for any person using in commerce in the Territories or the District of Columbia, in interstate commerce, or in commerce with foreign nations, a motor vehicle which discharged unburned hydrocarbons in amounts in excess of the standards set by the Surgeon General.

Hearings on this bill were held March 17, 1958, by the Special Subcommittee on Traffic Safety. Leading experts in the field were heard and a comprehensive record of 180 pages published, which is available from the committee.

At the beginning of the present session, Congressman Schenck introduced H.R. 1346, a modification of his bill in the previous Congress. Congressman McDonough introduced H.R. 1297, also dealing with the problem of motor exhausts. The bill H.R. 8238, here reported with amendments, was similar to H.R. 1346 but with modifications referred to below.

Because agency reports on H.R. 1346 and H.R. 1297 were discussed by the committee in detail in connection with consideration of H.R. 8238, and the adoption of the committee substitute, the text of these two bills and the agency reports thereon are printed hereafter in an appendix to this report.

Hearings held on air pollution legislation

Hearings on air pollution legislation were held May 19 and June 24, 1959, by the Subcommittee on Health and Safety. At that time valuable information on the problem of unburned hydrocarbons was presented by representatives of the Public Health Service and others. These hearings have been printed and are available from the committee.

Additional hearings were held July 7, 8, and 9 by the subcommittee to consider automobile safety legislation, including the problem of unburned hydrocarbons.

Following the hearings, the legislation was considered by the subcommittee. Certain amendments were adopted to H.R. 1346, chiefly to section 2 to eliminate the objection raised by the Bureau of the Budget and the Department of Health, Education, and Welfare, that as written this section would necessitate the creation of a Federal enforcement organization in an area traditionally under State and local jurisdiction. Congressman Schenck thereafter introduced a new bill to incorporate the amendments adopted in the subcommittee and this became H.R. 8238, the bill considered by the entire committee.

In addition to the above objection, the Department of Health, Education, and Welfare, while agreeing that the provisions of H.R. 1346 relating to standards "are technically feasible of ultimate accomplishment," also opposed enactment of the legislation as introduced on other grounds set out in detail in a letter addressed to the chairman of this committee, included hereafter in an appendix to this report. After considering these objections and other aspects of the problem, the committee adopted an amendment in the nature of a substitute for the purpose of accelerating research into the problem. As outlined above, the committee substitute calls for a comprehensive study and report by the Surgeon General.

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NEED FOR THE LEGISLATION

Automobile exhaust research now is being conducted by the Public Health Service. In the hearings on May 19 and June 24 the scope and progress of this research was explored by the subcommittee.

The committee is concerned about the general problem of air pollution but desires to emphasize here the importance of giving the highest priority to an investigation of the role of motor vehicle exhaust gases, especially in view of the testimony in the record regarding the important part motor vehicle exhaust gases play in contributing to air pollution in major metropolitan areas.

Also, harmful toxic effects upon drivers of motor vehicles who inhale exhaust fumes may be an important contributory cause of automobile accidents, as pointed out by Dr. Zipf in the 1956 subcommittee hearings mentioned above.

Clearly, more information is needed about the part that unburned hydrocarbons play in contributing to air pollution in general, with the attendant ill effects on human health and comfort.

We need information on how to eliminate and control harmful, toxic, and irritating motor vehicle exhaust fumes. We need more information regarding the harmful effects of these fumes on public health.

In the May 19, 1959, hearings on air pollution control legislation, the subcommittee was told that scientists know there are pollutants in the air which cause cancer, particularly in laboratory animals, and that death rates from certain types of cancer and respiratory conditions are higher in urban areas where air pollution is greater. Statistics were cited which show that lung cancer rates are twice as high for the largest cities than in rural areas. Agriculture also suffers extensive damage from air pollution.

Extensive study of problem needed

The committee feels that extensive study of carcinogens (cancer-producing agents) which may be present in motor vehicles exhausts is urgent. In that connection, the following excerpt from a statement regarding air pollution research submitted by the Public Health Service in connection with the May 19 hearings (p. 32) is of interest:

> In something less than 4 years of effort in this field, several important and significant findings have emerged from medical research on air pollution and its effects on man. Evidence strongly suggests that the slowly progressive and subtle changes that may result from air pollution cause much of the distress and disability of our aging population. Certain air pollutants found in our cities are known to be experimentally carcinogenic for animals, and there is evidence that death rates for certain causes of death increase markedly with urbanization. Specifically, these causes include cancer of the lung, trachea, and bronchus, cancer of the stomach and esophagus, arterio-sclerotic heart disease, and myocardial degeneration. Incomplete evidence suggests that the dis-

tribution of cancer mortality within cities is related to the distribution of air pollution intensity. Further medical research on the effects of air pollution is needed in order to help delineate those factors which affect human comfort, health, and life spans, so that effective and practical control efforts may be undertaken.

In the hearings on H.R. 9368, 85th Congress, March 17, 1958, the subcommittee was told in a statement submitted by the Department of Health, Education, and Welfare (hearings, p. 120):

> It has been shown that auto exhausts contain substances which, when supplied to suitable experimental animals under appropriate conditions, will increase the frequency of cancer.

Reports of studies on exhaust fumes

The committee also considered the following memorandum from the Acting Surgeon General, dated July 14, 1959, submitted by the Secretary of Health, Education, and Welfare, in response to a request from the subcommittee chairman:

> The following information is provided in response to the request of Representative Kenneth A. Roberts, chairman, Subcommittee on Health and Safety, concerning the possible effects on health of automotive exhaust fumes.
>
> Automotive exhaust fumes, and the products that result after these fumes enter the atmosphere, include numerous groups of compounds of which the unburned and partially burned hydrocarbons are only one. To our knowledge, the only pertinent studies thus far undertaken that involve the deliberate exposure of human subjects to known mixtures, or constituents, of automotive exhausts, are the studies concerned with its effect in producing eye irritation.
>
> Our presently available information, therefore, is limited to knowledge obtained from controlled laboratory exposures of experimental animals to constituents of automotive exhaust. The results of two such studies, conducted by Dr. Paul Kotin and his associates at the University of Southern California, have been reported in Cancer (vol. 9, No. 5, 1956, and vol. 10, No. 6, 1957). These studies involved the exposure of both tumor-susceptible and tumor-resistant mice to ozonized gasoline, a form of unburned hydrocarbon. The exposures induced an increase in lung tumors of 100 percent in the tumor-susceptible mice, and produced lung tumors in 10 percent of the tumor-resistant mice. Other effects reported included higher death rates, lighter body weights and some reduction in fertility. Dr. Kotin, in his conclusion, states: "Differences in tumor rates and the production of hyperplastic and metaplastic changes in the bronchial epithelium in a highly refractory inbred strain warrant the consideration of polluted atmosphere characterized primarily by oxidation products of aliphatic hydrocarbons as a factor in human pulmonary carcinogenesis."
>
> In our opinion, these studies justify the conclusion that constituents of automotive exhaust fumes can produce

carcinogenic and other undesirable physiological effects in mice, and therefore might produce these effects in human beings. Whether they do so, however, cannot now be stated.

Discussions at Conference on Air Pollution

The need for extensive study of the contribution of motor-vehicle exhaust fumes to air pollution in metropolitan areas is indicated in papers prepared for presentation at the National Conference on Air Pollution in Washington, November 18, 1958.

Dr. Leslie A. Chambers, director of research, Los Angeles County Air Pollution Control District, said:

> Few sources of air pollution have been under such close scrutiny in recent years as the automobile and other petroleum fueled vehicles. This attention is well deserved on the basis of the firmly established major role of vehicular exhausts in the production of smog in Los Angeles, and the inevitable inference that automobile exhausts are contributing heavily to air pollution in other metropolitan areas.

Dr. Paul Kotin, associate professor of pathology, University of Southern California School of Medicine, Los Angeles, said:

> Certain epidemiological facets of the increasing incidence of lung cancer suggest that the atmospheric environment may be casually associated with this observed increase.

Dr. Lester Breslow, chief, Bureau of Chronic Disease, California State Department of Health, said:

> The findings of the several investigations briefly reported here add up to a substantial justification for concern about the long-term effect of repeated exposure to air pollution. Evidence is gradually accumulating which suggests that air pollution of various types chemically and physically, may be involved in such important lung conditions as chronic bronchitis, asthma, emphysema, and lung cancer.

Dr. Thomas F. Mancuso, chief, division of industrial hygiene, Ohio State Department of Health, Columbus, said:

> * * * I believe that air pollution represents a highly probable and important factor in the excess of lung cancer in urban areas, acting directly and augmenting the occupational exposures of men so that carcinogenic and cocarcinogenic agents of both environments may be involved.

Recommendations of National Conference

The National Conference on Air Pollution recommended additional research to devise effective control methods for various types of emissions, with particular attention to problems of automobile exhausts.

In a summary of the highlights of that conference, published by the Department of Health, Education, and Welfare (Public Health Service Publication No. 648), it is stated (p. 14):

> The transportation industry's greatest pollution problem is the exhaust emitted from the tailpipe of the automobile. Although the public is more aware of the smoke and odors

emitted from diesel engine buses, trucks and trains, these are relatively minor sources as compared to automobile exhausts.

The most significant emissions from automobile exhausts are carbon monoxide, oxides of nitrogen, and organic substances. The latter two are the major cause of the Los Angeles smog and are a problem of growing importance in many other cities. There are probably several thousand organic components involved, which have varying effects on eye irritation, toxicity, plant damage and visibility. More needs to be known about the individual components of exhaust emissions and the meteorological factors which govern the formation of reaction products. Satisfactory methods of reducing this pollution have yet to be developed, although the automobile industry has made some progress in achieving better combustion and thus reducing the amount of fuel that escapes into the air.

Studies of fumes in metropolitan areas

In the hearings March 17, 1958, on H.R. 9368, 85th Congress, Dr. Clarence A. Mills, professor of experimental medicine, University of Cincinnati, presented three exhibits giving some very interesting results of his study of air pollution problems. His testimony indicates the urgent need for further study of the part motor-vehicle exhaust fumes play in contributing to air pollution in metropolitan areas.

In his statement he had the following to say regarding his exhibit C, an article from the November 1957 issue of Cancer Research (hearings, p. 75):

> Now, exhibit C, the tobacco smoking, motor exhaust fumes and general air pollution in relation to lung-cancer incidence, represents a very serious effort to assay the various factors at work in the amazing and very alarming rise in lung-cancer incidence in American cities, much more in the cities than in the country districts, and the finger of suspicion has been pointed very strongly at tobacco smoking, there had been some suspicion of general urban air pollution being a factor also, but there had been no real serious effort at separate evaluation of those factors in this lung-cancer situation.
>
> This report, exhibit C, presents my findings there which, in essence, indicate tobacco smoking, and primarily cigarette smoking, as the major etiological causative factor in lung-cancer incidence, but that tobacco-smoking effect is more than doubled for those urban residents who drive more than 12,000 miles a year on an average in urban traffic.
>
> It is still higher for those tobacco smokers who drive that much and then live in the dirtiest part of the city.
>
> So we have there a very first strong hint that motor-exhaust fumes are a significant factor, mathematically significant also, in the incidence of lung cancer.

The committee recognizes the urgent need for additional and expanded research on the problem to determine how motor vehicle exhausts contribute to air pollution and the harmful levels of concentration endangering human health. This research is necessary to establish criteria upon which engineers can develop better control methods.

In a letter to the chairman of the Subcommittee on Health and Safety, dated July 16, 1959, Hon. Arthur S. Flemming, Secretary of Health, Education, and Welfare said:

> It should be pointed out that the role of the Public Health Service in the auto exhaust problem is essentially one of research related to the characterization of exhaust components and to their effect.

Comprehensive study necessary

In making the study called for in this legislation, it is expected that the Surgeon General will consult with and make use of the automobile manufacturing industry, members of appropriate professional societies, other medical and scientific organizations, specialists in the Bureau of Standards and other Federal agencies, and all others in a position to contribute to the solution of the many problems involved. The automobile manufacturing industry has been working on this problem many years and has spent large sums of money on research and development. The committee was assured that the industry would welcome any assistance the Surgeon General and his staff can give.

The following statement by Secretary Flemming (printed hearings p. 80) in response to a question asked in the hearings June 24, 1959, by Congressman Rogers of Florida outlines procedure which might be followed in carrying out the purposes of the reported bill:

> Now, I am not sure, as an individual, at this time as to how much responsibility we should place on the automobile industry for the situation that confronts us at the present moment. But I would like very much to have the Surgeon General in a position where he could appoint a hearing board that could sit and receive evidence from the automobile industry, receive evidence from the other side based on the research that had been conducted up to the present time, and then after having listened to the evidence on both sides, come out with some firm conclusions, at least as firm conclusions as the evidence would justify up to this particular point.
>
> He might very well say, "Here are three things, for example, that I have concluded. I don't think there is any question about them. Here is a fourth matter that I think requires additional research before we can arrive at a conclusion, and I think we ought to focus our resources on this particular area and get this research underway in order to see whether or not we can get an answer to the question."
>
> It seems to me the Federal Government is fortified by a procedure of this kind. If back of its leadership is a procedure of this kind, its leadership will be accepted more widely than would otherwise be the case, because it has certainly made every effort to get the facts on both sides, and then having made that effort, it states a conclusion or a series of conclusions.
>
> Now, I think that if the Surgeon General or the Department of Health, Education, and Welfare state some definite conclusions following a fair and open hearing of this kind—of course my idea would be these would be public hearings—that then the parties concerned are almost sure to pay atten-

tion to it even though we don't have any enforcement authority at all, and I don't think we should have at this point.

Problem recognized in highway safety report

The importance of the problem was recognized by the Secretary of Commerce in a report entitled "The Federal Role in Highway Safety," submitted to Congress March 3, 1959 (H. Doc. 93, 86th Cong., 1st sess.) in the following discussion of air pollution beginning on page 45:

> Exhaust systems of current motor vehicles are far from adequate, both with respect to durability and their production of unburned hydrocarbons. The toxic effects of a faulty exhaust system can contribute directly or indirectly to an accident. The need to replace a muffler of a new car after only a few thousand miles and within the first year of use is not unusual, especially for cars used primarily for short trips within the city. The corrosive vapors from the engine and the effects of salt used on streets for ice control can cause rapid deterioration of vital parts of the exhaust system. This type of failure, which can be prevented or delayed by use of better materials in the muffler and other parts of the exhaust system, bring carbon-monoxide concentrations in the vicinity of the passenger compartment, and under certain conditions can cause car occupants to become drowsy, experience eye irritation, headaches or nausea, or actually endanger their lives, depending on the length of exposure and, of course, the concentrations.

The report goes on to state:

> Beyond the individual effects of failures in the exhaust system, and the hazard it may have for those in the immediate vicinity, lies the mass problem of air pollution. The magnitude of motor vehicle air pollutions have only in recent years been widely appreciated by the affected public and by industry. Manifest chiefly in Los Angeles, where other normal sources of air pollution have already been put under strict control, and where climatic conditions aggravate the effects, motor vehicle air pollution was the subject of a bill (H.R. 9368) introduced in the 85th Congress, 2d session. As the evidence at a hearing on this bill indicated, the public jurisdictions and the industry have spent extensive sums in working toward a practical solution of the ozone-smog problem, which will undoubtedly become more acute in other large cities. Control devices for motor-vehicle exhausts, usually designed as afterburners, have been developed and tested but no wholly satisfactory solution has been reached. Because of the menace to general health as well as to safety in highway transportation, growing interest in air pollution can be expected.

APPENDIX

TEXT OF H.R. 1346, 86TH CONGRESS

A BILL To prohibit the use in commerce of any motor vehicle which discharges substances in amounts which are found by the Surgeon General of the Public Health Service to be dangerous to human health

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That (a) the Surgeon General of the Public Health Service (hereinafter in this Act referred to as the "Surgeon General"), shall, after conducting such research as he may deem to be necessary but not later than twelve months after the date of enactment of this Act, prescribe and publish in the Federal Register, standards as to the amounts of substances which he considers to be safe, from the standpoint of human health, for a motor vehicle to discharge into the atmosphere under the various conditions under which the vehicles may operate; such standards shall be prescribed and published for those substances on which sufficient scientific information is available to permit judgment as to the adverse effect upon human health which may be produced.

(b) Standards prescribed pursuant to subsection (a) of this section may be revised from time to time by the Surgeon General and shall be enlarged by the Surgeon General from time to time by the inclusion of standards for additional exhaust components, as adequate technical information concerning their health effects becomes available. Such revised or enlarged standards shall be published in the Federal Register.

SEC. 2. (a) No person shall use any motor vehicle in commerce which discharges substances in amounts in excess of the standards prescribed by the Surgeon General pursuant to the first section of this Act: *Provided,* That the Surgeon General finds that a reasonable method of controlling such discharges within the specified standard is available.

(b) Whoever violates this section shall be fined not more than $500, or imprisoned not more than one year, or both.

SEC. 3. As used in this Act—

(1) The term "commerce" means commerce among the several States, with foreign nations, in any Territory, or in the District of Columbia, or between any Territory and a foreign nation, or between the District of Columbia and any State;

(2) The term "Territory" includes the Territories and possessions of the United States and the Commonwealth of Puerto Rico; and

(3) The term "motor vehicle" means any vehicle propelled by mechanical power and used for transporting passengers or freight whether on a fixed track or on a highway.

SEC. 4. Section 2(a) of this Act shall take effect one year after the date on which standards are first prescribed and published in the Federal Register pursuant to subsection (a) of the first section of this Act and thereafter any standards which are revised pursuant to subsection (b) of the first section of this Act shall take effect one year after the date on which they are published in the Federal Register.

TEXT OF H.R. 1297, 86TH CONGRESS

A BILL To prohibit the manufacture, sale, or use in commerce of any motor vehicle which discharges unburned hydrocarbons and other noxious gases in amounts dangerous to human health

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That (a) the Surgeon General of the Public Health Service (hereafter in this Act referred to as the "Surgeon General"), shall, after conducting such research as he may deem necessary, but not later than six months after the date of enactment of this Act, prescribe and publish in the Federal Register standards as to the amounts of unburned hydrocarbons and other noxious gases harmful to human health which are safe, from the standpoint of human health (with particular reference to the carinogenic nature of such unburned hydrocarbons and other gases) for a motor vehicle to discharge into the atmosphere.

(b) Standards prescribed pursuant to subsection (a) of this section may be revised from time to time by the Surgeon General. Such revised standards shall be published in the Federal Register.

SEC. 2. (a) The manufacture for sale, the sale, the offering for sale, the use in commerce, or the importation into the United States of any motor vehicle which discharges unburned hydrocarbons or other noxious gases harmful to human health in amounts in excess of the standards prescribed by the Surgeon General pursuant to the first section of this Act, shall be unlawful.

(b) Whoever violates this section shall be fined not more than $1,000, or imprisoned not more than one year, or both.

SEC. 3. As used in this Act—

(1) The term "commerce" means commerce among the several States, with foreign nations, in any Territory, or in the District of Columbia, or between any Territory and a foreign nation, or between the District of Columbia and any State;

(2) The term "Territory" includes the Territories and possessions of the United States and the Commonwealth of Puerto Rico; and

(3) The term "motor vehicle" means any vehicle propelled by mechanical power and used for transporting passengers or freight whether on a fixed track or on a highway.

SEC. 4. Section 2(a) of this Act shall take effect one year after the date on which standards are first prescribed and published in the Federal Register pursuant to subsection (a) of the first section of this Act and thereafter any standards which are revised pursuant to subsection (b) of the first section of this Act shall take effect one year after the date on which they are published in the Federal Register.

Letters From Executive Departments and Agencies

The following letters were received and considered by the committee:

The Secretary of Health, Education, and Welfare,
Washington, July 16, 1959.

Hon. Kenneth A. Roberts,
Chairman, Subcommittee on Health and Safety,
House of Representatives, Washington, D.C.

Dear Mr. Chairman: Thank you for your letter of June 29, 1959, regarding my testimony before your Subcommittee on Health and Safety. I appreciated the opportunity to present the interest of the Department of Health, Education, and Welfare in the very important legislation related to the extension of the Federal Air Pollution Research and Technical Assistance Act.

In response to your request, I am enclosing material which describes the projects the Department of Health, Education, and Welfare is conducting or supporting which relate to the control of auto exhaust emissions.

It should be pointed out that the role of the Public Health Service in the auto-exhaust problem is essentially one of research related to the characterization of exhaust components and to their effects. In this way the Public Health Service will provide the basic information that may be required ultimately in the development of control measures for substances which may be proven to be harmful. We feel that the development of actual control measures is largely the responsibility of industry. The Public Health Service is also sponsoring fundamental studies concerned with catalytic and noncatalytic afterburners, with the role of engine maintenance and fuel composition, and other approaches to the problem. In all of its activities in this area, the Public Health Service is cooperating fully with industry and others concerned.

If we may be of further assistance, please do not hesitate to call on us.

Sincerely yours,

Arthur S. Flemming, *Secretary.*

Executive Office of the President,
Bureau of the Budget,
Washington, D.C., July 8, 1959

Hon. Oren Harris,
Chairman, Committee on Interstate and Foreign Commerce,
House of Representatives, House Office Building,
Washington, D.C.

My Dear Mr. Chairman: This is in reply to your committee's requests for views of the Bureau of the Budget dated February 5, 1959, on two legislative proposals: H.R. 1297, a bill to prohibit the manufacture, sale, or use in commerce of any motor vehicle which discharges unburned hydrocarbons and other noxious gases in amounts dangerous to human health, and H.R. 1346, a bill to prohibit the use in commerce of any motor vehicle which discharges substances in amounts which are found by the Surgeon General of the Public Health Service to be dangerous to human health.

These similar bills would authorize the Surgeon General to promulgate and revise standards for maximum amounts of motor vehicle wastes to be discharged into the atmosphere, would make unlawful the use of vehicles discharging substances in excess of such standards, and would provide a penalty for violation. The principal differences are: H.R. 1297 specifies that standards would first be published in the Federal Register 6 months after enactment of the bill and makes reference to the carcinogenic nature of motor vehicle exhaust; H.R. 1346 prescribes that standards would first be published 1 year after enactment of the bill, that standards need be devised only for those substances on which sufficient information is available, that standards would be developed for vehicles under various operating conditions, and that use of vehicles discharging in excess of the limitation would be unlawful only if a reasonable method of controlling the discharges is available.

These proposals would necessitate the creation of a Federal organization to inspect and enforce motor vehicle safety under the standards which would be defined by the Surgeon General. Such inspection and enforcement are traditionally under State and local jurisdiction and are matters in which the Federal Government most suitably renders advice and technical assistance.

In reporting on these measures the Department of Health, Education, and Welfare points out that at the present time a sufficient amount of scientific information to establish standards for substances emitted from motor vehicles is not available, that such information could not be obtained before the date prescribed in H.R. 1297, and that differing atmospheric conditions in various parts of the country make inappropriate the establishment of uniform national standards under Federal statute. Nor is commercial production of suitable control devices yet practicable. The Department of Commerce raises the additional problem of enforcement of the proposed standards. Federal regulation and inspection of the Nation's numerous motor vehicles would be both difficult and expensive.

This Bureau concurs in the conclusions reached by the Departments of Commerce and Health, Education, and Welfare and joins them in recommending against enactment of these bills.

Sincerely yours,

PHILLIP S. HUGHES,
Assistant Director for Legislative Reference.

THE SECRETARY OF COMMERCE,
Washington, D.C., July 10, 1959.

Hon. OREN HARRIS,
Chairman, Committee on Interstate and Foreign Commerce,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: This letter is in reply to your recent request for the views of this Department with respect to H.R. 1297 and H.R. 1346, similar bills relating to the use of motor vehicles which discharge unburned hydrocarbons and other noxious gases in amounts dangerous to human health.

The bills would authorize the Surgeon General to conduct research involving fumes discharged by motor vehicle exhausts, to determine the effect of these fumes on human health, and to promulgate stand-

ards based on this research as to the amount of such fumes which may be discharged from motor vehicles.

The Department recommends against the enactment of these bills.

Traditionally, the regulation and inspection of vehicles has been within the jurisdiction of the States. Estimates for 1958 indicate that there are in the United States approximately 68 million registered vehicles of all types. Enforcement of the proposed standards by the Federal Government, therefore, would be a difficult and expensive undertaking.

The time limits available for research which would be imposed by the two bills are believed to be impractical. H.R. 1297 provides a 6-month and H.R. 1346 provides a 12-month period, after the date of enactment, within which the standards would be issued. Although methods exist for determining the amount of unburned hydrocarbons discharged, they are neither quick nor simple. Furthermore, the amounts discharged vary with the speed and mechanical condition of the vehicle. It would appear that standards issued within either of the prescribed times would not be based on full and adequate research. Available information indicates that considerable expenditures and efforts have been made by official agencies and industry but that an entirely feasible solution has not been reached on a reasonable method of control. Exhaust filters or other devices prescribed for mandatory installation based on inadequate research would be of limited effectiveness and subject to becoming obsolete as new devices, based on continuing research, are developed.

In connection with the foregoing, it is observed that section 2(a) of H.R. 1346 provides that the standards would be enforced only if the Surgeon General finds that a reasonable method of controlling exhaust discharges is available.

The problem is serious, in some areas at least, but the present research and development efforts, largely in the hands of industry, need understanding assistance and interpretation by the governmental authorities most concerned before satisfactory regulations can be designed. The Federal Government should cooperate, as needed, with the automotive engineers, with State motor vehicle and health authorities, and other appropriate persons on the broad aspects of the problem, but enforcement beyond that provided by the State and local jurisdictions cannot be readily justified, since the safety phase of the motor vehicle exhaust problem is highly localized.

For these reasons this Department recommends against enactment of these bills.

We have been advised by the Bureau of the Budget that it would interpose no objection to submission of this report to your committee.

Sincerely yours,

FREDERICK M. MUELLER,
Acting Secretary of Commerce.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE,
Washington, July 13, 1959.

Hon. OREN HARRIS,
Chairman, Committee on Interstate and Foreign Commerce,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: This letter is in response to your request of February 5, 1959, for a report on H.R. 1297, a bill to prohibit

the manufacture, sale, or use in commerce of any motor vehicle which discharges unburned hydrocarbons and other noxious gases in amounts dangerous to human health, and H.R. 1346, a bill to prohibit the use in commerce of any motor vehicle which discharges substances in amounts which are found by the Surgeon General of the Public Health Service to be dangerous to human health.

The bill, H.R. 1297, would require the Surgeon General of the Public Health Service to prescribe and publish in the Federal Register, not later than 6 months after the date of enactment of the act, standards as to the amounts of unburned hydrocarbons and other noxious gases which are safe, from the standpoint of human health (with particular reference to the carcinogenic nature of unburned hydrocarbons and other gases) for a motor vehicle to discharge into the atmosphere.

It would provide criminal penalties, effective 1 year from the publication of standards, for the manufacture for sale, the sale, the offering for sale, the use in commerce, or the importation into the United States of any motor vehicle which discharges unburned hydrocarbons or other noxious gases in amounts in excess of such standards.

Research experts who are now working on this problem in this Department advise that the scientific information required to justify and furnish the quantitative basis for the establishment of health protection standards for unburned hydrocarbons and noxious gases in motor vehicle exhausts is not now available and such knowledge could not be developed realistically within the period specified in the bill.

During the recent National Conference on Air Pollution held in Washington, D.C., on November 18–20, 1958, it was reported that more needs to be known about the individual components of exhaust emissions and the meteorological factors which govern the formation of reaction products. Satisfactory and practicable methods of reducing this pollution have yet to be developed. In this connection, it was reported in January of 1959 at the annual meeting of the Society of Automotive Engineers that certain experimental exhaust treatment devices have shown promise under test conditions. These reports also pointed up serious shortcomings and complications that will require much additional study, testing and development before any of the devices could be made practicable and dependable enough for commercial production and wide application.

The Public Health Service has further informed me that carcinogenicity for some animals has been demonstrated in certain high boiling fractions of petroleum, that airborne hydrocarbons have been shown to have carcinogenic properties in some laboratory animals, that known carcinogenic substances are being measured in particulates collected from the open atmosphere in several American cities, and that tumors have been caused by exposure of laboratory animals to automobile exhausts. Further studies will have to be made, however, before these and other data can be projected for appraisal of the hazard to human beings. In addition to carcinogenic considerations, there are other potential health hazards associated with substances in automobile exhaust to which further intensive attention will have to be given.

Research on these subjects is being supported by this Department and other organizations. In addition, this Department as well as commercial and other agencies, has intensified support of research aimed at the elimination, or major reduction of, unburned hydrocarbons and other materials in motor vehicle exhausts.

In summary, there is not now available the scientific knowledge needed to carry out the specified purposes of H. R. 1297.

The bill, H.R. 1346, would require the Surgeon General of the Public Health Service to prescribe and publish in the Federal Register, not later than 12 months after the date of enactment of the act, standards as to the amount of substances which he considers safe, from the standpoint of human health, for a motor vehicle to discharge to the atmosphere. Such standards, would, however, have to be established only for those substances on which sufficient scientific information is available to permit judgment as to adverse effects upon human health.

Provision is also made for the revision of these standards by the Surgeon General and their enlargement by the inclusion of standards for additional exhaust components as adequate technical information concerning their health effects becomes available.

Sections 2 and 3 provide for criminal penalties for using in commerce among the several States, in the Territories or District of Columbia, or in commerce with foreign nations, a motor vehicle which discharges substances in amounts in excess of such standards, provided the Surgeon General found there was available a reasonable method of controlling such discharges. Section 4 contains definitions of terms used in the bill and fixes the effective dates of the various provisions of the bill.

The limitations of existing technical knowledge, indicated previously in regard to H.R. 1297, are also applicable to this bill. However, H.R. 1346 would require the Surgeon General to prescribe standards only for those substances on which sufficient scientific information is available to permit judgment, and would permit the Surgeon General to revise and enlarge such standards as additional adequate technical data became available. These provisions of H.R. 1346, therefore, are technically feasible of ultimate accomplishment.

We have no doubts as to the ultimate disirability of developing and publishing standards or criteria relating to concentrations of various contaminants in the open atmosphere, including those derived from the exhausts of motor vehicles. Such standards or criteria are concerned basically with conditions in the ambient atmosphere and are, of course, related to the meteorological conditions and the intensity of pollutional contributions, both of which vary greatly from place to place. The establishment, therefore, of uniform standards under a Federal statute does not appear appropriate to the needs at the present time.

With regard to the regulatory features of this bill, the preponderance of air pollution problems in the United States is intrastate in character, and the control of the relatively smaller portions of the overall problems which could be reached by Federal legislation relating to interstate commerce would not, in itself, be effective. On the other hand, the practical totality of air pollution problems is susceptible to legal control by official agencies of State and local governments. We,

therefore, do not favor the imposition of Federal legal controls as proposed in this bill. We are in full agreement with the congressional declaration of policy, as enunciated in the act of July 14, 1955 (42 U.S.C. 1857), an act to provide research and technical assistance relating to air pollution control, that the primary responsibility for the control of air pollution is that of the States and local governments.

Under the present circumstances, we believe that the Federal effort in this field can be most effective by research and technical assistance leading to the development of standards or criteria of air quality appropriate for use in State or local control programs. In this connection the need for such standards or criteria has been recognized by such organizations as the American Public Health Association, the Association of State and Territorial Health Officers, the Conference of State Sanitary Engineers, the American Society of Mechanical Engineers, the National Advisory Committee on Air Pollution and others. The Public Health Service has been aware of this need and, under existing authorizations, is carrying on and supporting work relating to the development of standards or criteria for allowable concentrations of contaminants in the air. In addition, we believe that encouragement and assistance to State and local agencies in the development of needed control programs would be more effective than the enactment of Federal control legislation.

Thus, the needed Federal action in this field is the development and dissemination by the Surgeon General of such recommended standards or criteria pertaining to allowable concentrations of contaminants in the open atmosphere as he considers useful for the guidance of State and local governments and other organizations. The Public Health Service is already cooperating with health authorities in one State in a special project aimed at the development of standards of air quality for the ambient atmosphere and of allowable concentrations of contaminants in automobile exhausts. Since the Surgeon General already has the authority needed for such action, further legislation for this purpose does not appear necessary.

In summary, we regard the regulatory features of these bills as undesirable, and believe the provisions concerning the development of technical data and the dissemination of information thereon are unneccessary.

We, therefore, recommend against enactment of the present bills.

The Bureau of the Budget advises that it perceives no objection to the submission of this report to your committee.

Sincerely yours,

ARTHUR S. FLEMMING, *Secretary.*

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Union Calendar No. 353

86th Congress, 1st Session - - - - - - House Report No. 815

RESEARCH IN CBR

(Chemical, Biological, and Radiological Warfare)

REPORT

OF THE

COMMITTEE ON SCIENCE AND ASTRONAUTICS

U.S. HOUSE OF REPRESENTATIVES

EIGHTY-SIXTH CONGRESS

FIRST SESSION

[No. 23]

AUGUST 10, 1959.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

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LETTER OF TRANSMITTAL

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C., July 27, 1959.

Hon. OVERTON BROOKS,
Chairman, Committee on Science and Astronautics.

DEAR MR. CHAIRMAN: I am forwarding herewith for committee consideration a report on "Research in CBR (Chemical, Biological, and Radiological Warfare)" prepared by Dr. Charles S. Sheldon II, technical director, and reviewed by other members of the professional staff.

The report is based on both open and executive session hearings before the full committee, held on June 16 and 22, 1959, together with additional staff study.

The importance of these forms of toxic warfare is so great that the closest attention should be paid to the present and expected capabilities of many nations in this area of research.

CHARLES F. DUCANDER,
Executive Director and Chief Counsel.

LETTER OF SUBMITTAL

COMMITTEE ON SCIENCE AND ASTRONAUTICS,
HOUSE OF REPRESENTATIVES,
Washington, D.C., August 10, 1959.

Hon. SAM RAYBURN,
Speaker of the House of Representatives,
Washington, D.C.

DEAR MR. SPEAKER: By direction of the Committee on Science and Astronautics, I submit the enclosed report, "Research in CBR (Chemical, Biological, and Radiological Warfare)."

This report has been prepared following investigative hearings by the full committee into the status of research and development in CBR, including the new psychochemicals, to gain an understanding of both their present capabilities and what lies in the future as research proceeds.

It deserves emphasis that research in several countries of the world is opening up astonishing new capabilities in CBR, and, short of an extremely complete inspection system (which seems unlikely now), the United States cannot afford to lag behind in its own program if it is not to fall victim to one of these new forms of warfare.

The committee in adopting this report and approving its submission to the House wishes to convey the strong sense of urgency it feels that the American people should gain a better understanding of these new weapons.

OVERTON BROOKS, *Chairman.*

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Union Calendar No. 353

86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 815

RESEARCH IN CBR
(CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL WARFARE)

AUGUST 10, 1959.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. BROOKS of Louisiana, from the Committee on Science and Astronautics, submitted the following

REPORT

RESEARCH IN CBR

(Chemical, Biological, and Radiological Warfare)

INTRODUCTION

This report is designed in part to illustrate by specific example the key role of research in changing national strategy. CBR—the shorthand for chemical, biological, and radiological warfare—is toxic warfare against man, his animals and crops, rather than explosive warfare which destroys both man and his material possessions such as buildings and machines. Much emotion and political portent is associated with these forms of warfare. But they are very real and very likely to be used against the United States. This committee has a public responsibility to draw as clear a picture as possible of what is at stake in the decision to pursue or not to pursue a comprehensive program of scientific research related to these agents which are used in CBR. This decision, in turn, will determine an important potential national effort.

The world has not yet reached the point where the welfare and independence of each people can be guaranteed by purely peaceful means. This is the goal we seek as do many other nations. But history until now has shown that at least some powerful nations with military resources have been required to hold in check the overweaning ambitions of the few, to protect both themselves and smaller nations which prefer to be left in peace, or which in any event are in no position to use power politics on a large scale.

Military strength, whether it has served its best purpose of dissuading nations from resort to war, or whether it has been used to gain national objectives in battle, is composed of many elements. It requires purpose, organization and discipline, trained manpower, a supply of superior weapons, positions of strength, secure communications, often including control of the sea, and more recently the air. Military strength has also required, particularly in modern times, industrial capacity as well as manpower reserves.

Although there are certain common and continuing elements of military strength, it is equally important to note that there have been evolutionary and revolutionary forces at work, too, which invalidate past judgments which once were wise. The rules of war have sometimes alternated between limited actions and something approaching total war. Advancing technology also has given the advantage alternately to offensive and to defensive weapons. A great danger illustrated many times is for a nation once powerful to continue to rely on outmoded concepts. It is thus that many great states have been toppled in the past.

In this century, industrial power has been extremely important to military strength. In two world wars, the capacity to pour out

weapons and food and transport have in the end prevailed over ingenious new weapons and tactics, but in some cases by rather narrow margins. War has become more total again by involving whole populations. Blockade and submarine warfare matched against great productive efforts illustrate one aspect of this. Massive air assault reaching behind ground battle lines represents another. War has added a new dimension in more pronounced form as a result of the Communist revolutionary movement: Even when major conventional forces are not in open conflict, the cold war of propaganda, subversion, and guerrilla fighting goes on.

Although World War II brought many innovations, some of which are now important elements in the use of even newer techniques, as for example radar, there were two developments of particularly great significance to the period which lies ahead. One of these is nuclear energy; the other is the missile.

Until recently, great industrial strength was required to achieve a nuclear weapons capability, and perhaps still is to develop an overwhelming missile capability. But industrial strength plays a different role today from what it did even in World War II, when overcoming attrition was important. Today a strong economy cannot win a war from a standing start when the new weapons are employed. It is weapons and forces in being which count most. But only a strong economy can pursue vigorously in time of peace the development of the new weapons which constantly outmode those already in stockpile.

Most students of the problem recognize the overwhelming importance of the nuclear deterrent to the survival of America and the free world. Considering the pressures which have been applied even so against the free world it seems likely that nothing else has saved us from overt attack by the main forces of the Communist states.

Once it was clear that the atomic bomb was no longer an American monopoly, followed by similar availability of thermonuclear knowledge, it was inevitable that new strategic assessments would have to be made. Until workable and foolproof control and inspection systems can be developed, continuing to build a strong thermonuclear capability and wedding this to the new missiles is essential to survival. But at the same time, who can afford to use the new weapons except in an ultimate showdown which might very well destroy most of civilized mankind? The willingness to pay this price if need be is present in the world, but sane men are obviously going to look for other ways to attain national objectives which do not include the strong possibility of national suicide, if at all possible.

Solutions may lie in negotiation and political arrangements. They may even lie in "peaceful economic competition," which is a challenge thrown to the United States. But it is also true that continuing basic differences in goals and objectives between the two major blocs of nations require prudent attention to alternative possibilities of warfare which may come into use, and to what steps are required in defense.

If the major powers refrain from using their thermonuclear weapons, will the cold war continue anyway, and will our position in the world be nibbled away? If there is an ultimate agreement to insure that mass destruction nuclear weapons are removed from arsenals, will the United States suddenly find that any continuing race for military strength will rest once again on manpower and industrial output of conventional weapons? These are very grave questions without simple

answers. We cannot match the manpower numbers of the Sino-Soviet bloc without the willing help of many allies. If prevailing competitive rates of industrial output increase are continued, then we even face a serious threat from conventional weapons and military supplies produced in countries which are willing to squeeze their consumers harder than our people want to be pressed. At the very least, it suggests serious readjustments in the years ahead for our mode of life as well as our relations with other nations.

The Committee on Science and Astronautics is concerned with public policy aspects of research developments in the fields assigned to its jurisdiction, as these activities impinge upon our national life. It is not our role to develop national military strategy. But it is important that this committee call to the attention of the Congress and the people new developments in science which are occurring at the research stage and which later will have to be considered in the context of our military planning, as well as those things which are important primarily to our general scientific advance and well-being in peaceful context.

Investigations of this committee in the field of CBR—chemical, biological, and radiological—warfare suggest that there are developments which require greater public understanding, if the best possible military and defense posture is to be attained. CBR warfare is much misunderstood: It can be just as disagreeable as any of the other forms of destruction in vogue in the world; yet it also offers some rays of hope for a more sane approach to an activity which we wish could be classified as irrational. This report cannot give final answers to many questions about CBR warfare, but perhaps it will provide a basis for further discussion.

DEFINITIONS AND ANTECEDENTS

Chemical warfare is the intentional employment of toxic gases, liquids, or solids to produce casualties, and the use of screening smoke or incendiaries. Biological warfare is the military use of living organisms or their toxic products to cause death, disability, or damage to man, his domestic animals, or crops. Radiological warfare employs the harmful ionizing effects of radiation against man, whether directly or indirectly, with nuclear weapon fallout the principal although not the only means for generation and distribution of agents.

The beginnings of chemical warfare are lost in antiquity. References to particular nations are not to point the finger of blame, but to illustrate something of trend. Incendiary chemicals are known to have been used at least since 1200 B.C. in Greece, were also in use in India, and by the Romans. "Greek fire" was invented about 600 B.C., with the property of spontaneously bursting into flame on contact with water. Incendiaries and flamethrowers are part of the standard equipment of all military forces today. Smoke has also been used since early times to screen movements.

Poison gas is known to have been proposed for use in the Crimean War against the Russians and in our Civil War against the Confederates, but neither suggestion was put to the test. Tear gases for harassment purposes were used by the French in August 1914, followed by German and British use of similar agents later. The first significant gas attack, however, was the German use of chlorine on April 22,

1915, against the British and French at Ypres. It brought military surprise and demoralization of the forces attacked. The British retaliated in kind 6 months later at Loos. After the April attack, the French and Germans tried several other casualty gases of the choking type. But the next major step was the German introduction of phosgene, a choking gas which could penetrate the crude gas masks then in existence. This was in December 1915. Again, protective masks were improved, so that the Germans added a vomiting gas to force men to remove their masks in order for the phosgene to reach their lungs. They introduced mustard gas in July 1917. This blistering agent could produce casualties even among men wearing masks. Another family of toxic gases was introduced by the French and the Austrians in 1916—the blood gases. The first American troops to be attacked with gas were hit by German phosgene and chlorpicrin on February 25, 1918. The first American use of gas was phosgene against the Germans in June 1918.

In total, both sides employed about 17,000 chemical troops and caused 1.3 million casualties, but only 91,000 were deaths—about one-fourth the ratio of wounded to dead as obtained with other weapons. Something like 9 million artillery shells filled with mustard gas were fired, producing 400,000 casualties, nearly 5 times as effective as shrapnel and high explosive shells. One-third of U.S. casualties were caused by gas, but only 2 percent of these died, in contrast to 25 percent of nongas casualties.

In 1936, the Italians used mustard gas in Abyssinia against the bare feet of the local forces. Both Italy and Abyssinia were signatories of the 1925 Geneva protocol against the use of gas. A large number of small gas attacks were made by the Japanese against Chinese forces in the period 1937 at least until 1943.

Major contestants in World War II carried toxic gases with them, but they did not come into use—aside from the China cases cited above. This may relate to the warnings of retaliation which had been issued by the Allies. If true, the importance of a retaliatory capability is well illustrated. Incendiaries represented the principal chemical munition used in that war. The most startling discovery at the close of the war was that Germany had stocks of a new gas of the nerve poison category far more deadly than the standard gases of the Allies. Some of these stocks were seized by both the Western and the Soviet forces, and the latter also obtained the factory which produced them, which was dismantled for reassembly in the U.S.S.R.

The Korean war did not use casualty gases, but screening smokes were widely employed.

Prohibition of gas warfare was agreed to by a number of countries at The Hague in 1899, including ratification by Germany, but neither the United States nor Great Britain signed this treaty. The treaty banned use of gas-filled projectiles. French use of tear gas rifle grenades in 1914, and German use of stationary pressurized chlorine gas tanks for the first attack made it a moot point as to whether or how any treaty obligations had been violated. The French pointed out that tear gas was used for controlling civil commotion, and therefore could hardly be called resort to a war gas.

A new attempt was made in 1921 at Washington to prohibit use of war gases and similar materials. This failed of ratification by France, and hence under its terms was void. In 1925 a treaty at the Geneva

Conference called not only for prohibition of war gases but also bacteriological warfare. Great Britain, the U.S.S.R., and some other nations, in ratifying the treaty made it clear they were bound only in relation to other countries complying with the treaty terms. The United States, Japan, Czechoslovakia, Argentina, and Brazil did not sign the treaty.

Biological warfare also has obscure antecedents which go far back in history. Poisoning of wells was an old trick. In the 14th century, the Tartars besieging the Italians in a fortress in Crimea threw over the wall the bodies of plague victims, forcing abandonment of the fortress. By the 16th century, an Italian tactical manual described how to construct artillery shells for delivery of disease to the enemy.

From the very nature of the biological weapon, it is difficult to provide definite proof of its deliberate employment, for disease often accompanies war. It is reported that in colonial days European traders passed out the blankets of smallpox victims to Indians in North America to reduce their fighting strength. There is definite evidence that in more recent times German agents in this country inoculated animals being shipped to Europe so that diseases would be carried there. They also infected Rumanian cavalry horses with glanders.

Active programs of biological warfare research were carried on in the 1930's in Germany, the U.S.S.R., and Japan. Limited biological warfare may have been tested by Japan in China during the period of World War II. No large-scale use of BW, as it is called, has been attempted, and therefore in this sense, its true potential is untested.

Radiological warfare was not a serious possibility until 1945, and has never been used deliberately. The initial burst of radioactivity from the bomb and fireball is not classed as radiological warfare. This definition may have to be modified if rumors of a new weapon aimed primarily at producing neutrons are substantiated. The fallout which comes later, with its lingering radioactivity, is so classed, as is any dissemination of radioisotopes by other means. The bombs burst over Japan were not intended to be radiological weapons, and there was no acute fallout problem because of the altitude of burst and relatively small yield by later standards. In Japan, about 60 percent of casualties were caused by blast, 25 percent by thermal radiation, and only 15 percent by gamma or other radiation. Today the story could be quite different, judging from air samples of Soviet, American, and British tests, and possible patterns of employment. Some estimates place potential radiation casualties as high as 96 percent of the total.

CHEMICAL AGENTS

The conventional chemical agents well known to most nations fall into several categories. Physically, they may be gases, liquids, or solids at ordinary temperatures. Tactically, they may be classed as casualty, training and riot control, screening smokes, signaling smokes, and incendiaries. The war gases may be classed by physiological effect as choking, blood, nerve, blistering, vomiting, and tear agents. Some are persistent, providing a continuing hazard; others are nonpersistent.

In World War I, over 3,000 substances were investigated for possible use in toxic war, but only 32 were actually tested in combat,

and only 12 attained noteworthy results. The descriptions which follow are typical of agents still in military stockpiles, but may or may not be found in the arsenal of any particular nation.

Typical blister agents are mustard, nitrogen mustard, and lewisite. These are cumulative poisons, rapidly absorbed through the skin. They not only blister but can cause blindness and attack many internal organs, including the lungs, bloodstream, and digestive tract.

The principal choking gas still considered important is phosgene. It is also a cumulative poison. It attacks the lungs so that the victim progressively moves from coughing to drowning in the liquid which accumulates in his own lungs. It also brings on nausea and vomiting, and the victim goes into shock. Diphosgene has similar effects.

Another group are the blood gases, such as hydrogen cyanide, cyanogen chloride, and arsine. These are not cumulative poisons, but in concentration are very deadly, travel via the lungs to the bloodstream to stop the transfer of oxygen in the blood, with consequent severe effects particularly on the central nervous system.

Tear gas, such as acetophenone, and vomiting agents are considered harassing agents rather than casualty gases, and may be used in mob and riot control in most parts of the world without provoking any particular indignation. The effects are acute, but pass in ordinary circumstances. Vomiting agents also may be used in combat in the hope of making men move their protective masks to become vulnerable to more deadly attack.

The really significant change, however, has been the appearance of nerve gases in the stockpiles of countries on both sides of the Iron Curtain. The nerve gases are so potent that they afford some of the same possibilities for widespread effect from small-scale delivery as do nuclear weapons. These organic phosphates were discovered in Germany while experimenting with insecticides. The Russians captured the German Tabun (GA) plant, moved it home, and GA has become their standard nerve gas. The United States has made Sarin (GB) its standard. There are other such agents in the series. Both GA and GB are very effective, although GB is four times as lethal in a given concentration. These gases create casualties before their presence can be detected by human senses. Less than a minute of exposure is lethal. As gases they travel via the lungs, although a liquid droplet will penetrate the skin. They react with cholinesterase so that nerve signals to the muscles are disrupted. Symptoms begin with respiratory troubles, salivation and perspiration, vomiting, cramps, involuntary elimination, and leading through convulsions to death.

The characteristics of all these gases are described as dispassionately as possible. The effects obviously are unpleasant, but not necessarily worse or better than those of high explosives or fire. All of them must be tailored in employment to specific tactical situations, taking into account the weather, terrain, type of combat, need to take territory, and gas discipline on both sides. Some will not be maintainable in sufficient concentration for long; others can linger for weeks, ready to catch the unwary. Any undisciplined group, particularly without protective gear including masks always ready, would be especially vulnerable to casualties and to panic. Probably only nerve gas of the presently known chemical agents offers the advantage of effectiveness

in limited weight to be worth dropping from aircraft or missiles in anything other than a local tactical employment. These are limited weapons, highly effective when used as intended, but not the answer to all military needs for producing casualties.

BIOLOGICAL AGENTS

Biological agents have not been used on a large scale not because they are not necessarily effective, but because they still involve a number of unknowns. Their real potential lies in the future. They can conceivably become the most potent and the most selective weapons available. But because they have not been used on a large scale, they are hard to assess positively with proper regard for their sensitivity to dryness and sunlight, and the dangers of infecting the using forces as well as the enemy. A satisfactory BW agent must consistently produce the death or disability intended. It must be manufacturable on a large scale, capable of efficient dissemination, and stable in storage, transit, and after dissemination.

Five classes of micro-organisms represent the primary classifications from among which BW agents are likely to be drawn:

(1) Fungi are most commonly usable against plants, although San Joaquin Valley fever (coccidioidomycosis) is a fungus infection which attacks man.

(2) Protozoa are a possibility, but are difficult to grow and to transmit. Malaria and amebic dysentery are diseases of this type.

(3) Few bacteria are harmful, but some important disease types exist. Potential BW agents are anthrax, brucellosis, glanders, tularemia, plague, bacillary dysentery, and cholera.

(4) Another group are the rickettsiae, including typhus, Rocky Mountain spotted fever, and Q fever.

(5) The next category consists of the viruses, such as influenza, psittacosis, and Venezuelan equine encephalitis.

In addition to these living organisms, there are toxins, the poisonous products the micro-organisms may form. The best known of these is botulism poisoning.

Possible antianimal agents are several viruses (East African swine fever, hog cholera, Rift Valley fever, rinderpest, foot-and-mouth disease, fowl plague, and Newcastle disease) and bacteria (anthrax, brucellosis, and glanders).

Crops can be attacked with viruses, bacteria, fungi, insects, and other pests. In addition, certain chemical agents can be grouped with these, such as plant growth regulators and chemical defoliants.

Typically, BW agents can be employed in forms where they are invisible, and cannot be tasted or felt. This makes their early detection difficult, and by the time the infection has been accomplished and incubation completed, wide dissemination could mean an acute problem for the target population. On the other hand, varying amounts of time must elapse before results are obtained so that the weapon is sometimes strategic rather than tactical, and not all conditions are ideal for dissemination.

In one sense, BW is nothing new and mysterious, and the agents it could conceivably employ are the same diseases which public health measures and personal hygiene traditionally aim to thwart. In past wars, epidemics among men and epizootics among animals have often

taken as many lives as the battlefield, even though the diseases were spread by natural rather than artificial means. But BW is something more in its potentialities. On a small scale introduced by saboteurs, it might represent just a supplement to natural health hazards. But it could also be employed on a large scale without dependence upon epidemics as the means to reach a large target population. Even well-known diseases if brought to a population not used to them can have a powerful effect. Dissemination by aerosol so that the intended victims breathe the agent directly into the lungs can also cause a surer and stronger take in some cases than natural means of infection provide. There is also the possibility that some laboratory will come up with a new mutant strain which is more virulent than the normal forms. If this were coupled with immunizing protection available only to the attacking nation, the results could be overwhelming.

RADIOLOGICAL AGENTS

Radiological agents can be classed into two groups: Those which may derive from a controlled reactor or accelerator, and are disseminated by means similar to BW and CW agents; and those which are deliberately created by the explosion of a nuclear or thermonuclear device at the combat location. There is no information on any stockpiled radiological agents for use in war, so any description of possibilities must be in general terms.

In theory, it is possible to create particular isotopes in a reactor or in an accelerator which could have uniform characteristics to fit a particular need. In practice, the costs may be too great in all countries to make this worth the trouble. Because of differences in half-life of particular isotopes, they may fit either tactical or strategic needs. For example, some isotopes could be so "hot" as to deny, let us say, a mountain pass to advancing troops, if the dose rate were so high that unacceptable casualties would result. But such a very "hot" isotope would also probably have a short half-life so that after a relatively brief time the area would be once again safe to reenter. On the other hand, other isotopes are long lived. Troops could pass through an area dusted with these and accept the low cost in current casualties and long-run somatic and genetic damage which might be very little if only a few hours were spent there. But the area might be quite unsafe for a garrison to stay in, or for a civilian population to live in and to raise crops.

The United States has made an effort to produce nuclear weapons which have a minimum of harmful fallout. These are particularly useful for antiaircraft defense purposes or for picking off specific military targets with a minimum of damage to surrounding areas and populations. But the world is also very much aware that large weapons may be employed in ways which produce acute fallout problems, as shown by the samplings made from Soviet tests. The debris from a bomb and the ground materials which may be sucked up into the cloud from a surface burst provide a mixture of isotopes with many different half lives, some of which create intense radioactivity and then taper off, and others of which cause lingering problems for an appreciable period, even years, conceivably.

There are three types of radiation given off by radioisotopes: alpha, beta, and gamma rays. Alpha rays are a stream of particles,

the nuclei of helium atoms, stripped of electrons. Because they are relatively large, they do not travel far—only 4 inches in air, and they penetrate only a short distance into the outer layers of skin. However, if an alpha source is ingested or inhaled, it can cause severe damage. Beta rays are free electrons, smaller particles. They travel several yards in air and will penetrate the body to the lower skin levels. They do less damage particle for particle entered than do the larger alpha rays. Ingestion or inhalation of beta sources is also dangerous. Gamma rays are an X-ray capable of penetrating matter of considerable thickness, and hence can do considerable damage.

The initial flash of a nuclear weapon and the fireball release a stream of both neutrons and gamma rays, both very penetrating. These effects and the damage they may cause are virtually instantaneous, but are not classed as radiological warfare. As suggested above, these definitions may change in the future. In contrast, fallout of radioactive isotopes may continue for some hours downwind from the blast, and after the heavier debris has been deposited, may continue in invisible form, as smaller particles come down at distances even hundreds of miles away. If creating fallout were a major purpose of the weapon, it would be classed as radiological warfare. Overhead cover, careful scrubbing, and protection of food and water are important to protection. Personnel wearing masks and protective clothing may be able to enter contaminated areas for limited periods of time, depending upon the readings shown on detection instruments which would indicate what dose is to be tolerated in comparison with the urgency of entry into such an area.

If a radioisotope were laid down as a munition apart from a nuclear weapon, standard tables of estimated half lives used for bomb debris would not necessarily be applicable. However, instrument readings with a time lapse would supply the information required to estimate half lives, so that judgments could be made as to whether the risk was one largely of hours or days and weeks.

Public discussion has identified the possibility of encasing a nuclear weapon with cobalt to increase vastly the hazards of fallout. Such an action probably would carry grave perils for the attacking nation as well as the victim when winds carried the radioactive cloud to many parts of the world. It is conceivable, however, that there are other substances which might be used to modify a nuclear weapon to provide other effects of a radiological nature.

Radiological warfare may or may not be developed in the future deliberately by one of the nuclear powers to include stored radioisotopes as well as byproducts of nuclear explosions. It is subject to limitations of difficulties and expense as well as great danger.

PSYCHOCHEMICALS

What has been reviewed above about CBR warfare is what has been generally available to the public, although too little noted in light of the dangers which confront us. Even the limited research which has been carried on in the United States in these areas has begun to reveal the general outlines of new forms of agents whose potential still lies in the future and which will yield only to more intensified research. Typical of the new agents are the psychochemicals or incapacitating agents. Five or six years ago they were almost

completely unknown. These could be so important that it would be catastrophic not to understand them thoroughly, and they could also offer a faint ray of hope toward a less total form of war.

The incapacitating agents fall into two general groups: Those which produce temporary physical disability such as paralysis, blindness, or deafness; and those which produce temporary mental aberration. Unlike the lethal war gases or the more virulent biological agents, these incapacitants can produce purely temporary effects without permanent damage. In this respect they more nearly resemble the riot control gases or some biological agents which are deliberately not killers. But in another respect, they are quite different. They act swiftly, and their arrival may not be heralded by any human senses, except as the effects are realized.

This committee saw demonstrated two different experimental agents of the physical incapacitating type. In short order, the test animals were completely immobilized, not so much as with general anesthesia where the subject sleeps, but limp with the eyes open and the body incapable of feeling pain. The drugs used have no discernible after-effects, and, depending on dosage, after a few hours or a couple of days the subject is completely recovered. In the case of one substance demonstrated, an antidote was administered to one of the paralyzed animals and it was quickly and unconcernedly back on its feet as lively as ever.

The psychochemicals which affect the mind were not directly demonstrated to the committee, but films of their experimental employment were shown. One film clip has previously been shown to the public on national television. In this, a cat receiving the new drug was so reversed in character that it was in great terror of mice in its cage, cowering and leaping about wildly to keep its distance from the mice. Another film seen by the committee demonstrated that troops exposed to one of these agents were not even conscious of their abnormal condition which was so changed that they were unable to follow simple commands and perform normal tasks with acceptable accuracy. Only an outsider not exposed and coming upon them would recognize their behavior as eccentric.

Experimental work, though promising, is still at an early stage, and until the processes become common knowledge in other countries, there is no reason to disclose their exact chemical nature. A derivative of lysergic acid, LSD 25, is the only one so far announced in this country. In the Soviet Union, Maj. Gen. Yu. V. Drugov of the Military Medical Service, Red Army, has stated that "special interest attaches itself to the so-called psychic poisons (mescaline, methedrine, lysergic acid derivatives) which are now used for simulation of mental disease."

The committee was told that although some of these agents in gaseous form imply the same logistic problems as the older war gases, others may have the concentration potentialities of the nerve gases. Nerve gas has about one seventy-fifth the weight and bulk of mustard gas. Some psychochemicals can be introduced into a water supply, and resist the effects of boiling or chlorination as a way to purify the water. Where a nerve gas moves from limited effects to lethal effects by a mere doubling of the dose, some of the incapacitating agents would require a thousandfold increase in the application to be lethal, and, therefore, truly live up to the promise of only temporary effect.

The incapacitating agents suggest employments where military necessity requires control of a situation, but where there is good reason for not harming either the surrounding population or even the intended target troops. They also suggest covert uses either to confuse defenses or retaliatory forces, or to affect the rationality of important leadership groups at some particularly crucial point in history.

THE PLACE OF TOXIC WARFARE

Attempts in the past to limit what is called CBR in war have been for a commendable and well-intentioned reason. Any step to limit the horror of war seems essentially desirable. But CBR can also represent a whole gradated spectrum of degrees of severity, and at the milder end of the spectrum, may represent a far lesser evil than many presently accepted forms of warfare. It must be made perfectly clear that the United States does not seek to find any opportunities for using these or other forms of warfare. The natural revulsion against the bizarre effects of both old and new CBR agents makes them ready targets for international propaganda campaigns. It must be stated unequivocably that the Communist-bloc countries are pursuing the study and the manufacture of these agents; and, therefore, their propaganda against any free world protective study along similar lines has a hollow ring.

The absolutely false charges against the United States at the time of the Korean war, with respect to use of biological warfare, were widely effective by dint of repetition and faked "evidence." The Communist press has already tried to make propaganda capital out of the hearings before this committee on CBR, falsely pretending our people are plotting use of these materials and ignoring their own record of extensive preparation. Why do they protest so loudly? It cannot be compassion for mankind, which they have never rated highly in doctrine or in behavior. It could be a reflection of their own advanced development of such capabilities which they hope will not be matched in the free world.

It is important to recognize some of the possible applications of CBR. If the time comes when a general war breaks out—a fate no rational people can seek in this age—it is almost certain that thermonuclear weapons will be used against this country. The blast and the fire would be accompanied by even more widespread radiological effects, requiring shelters and protection of food and water for the survivors. Soviet Admiral Gorshikov has stated that future war will be characterized by "various means of mass destruction, such as atomic, thermonuclear, chemical, and bacteriological weapons." This suggests that with the destruction and confusion attendant upon the nuclear attacks, enemy submarines could also throw in chemical and biological warhead missiles, or release such agents as an invisible cloud off our shores to attack some areas. These CBR agents are search weapons, capable of penetrating ordinary positions of strength and of being sucked into the ventilation shafts of conventional shelters where their victims have been conveniently grouped for destruction.

A second way in which certain of these agents could be used against us is by covert attack. Timed to coincide with a general attack, they could confuse personnel of antiaircraft batteries and interceptor

pilots. Introduced into a command center, there is no telling what psychochemicals would do, except that the results would be disastrous.

In some situations, employment of CBR would be the lesser of evils as compared with other forms of attack. For example, at the time Iwo Jima had to be taken in 1945, war gases were available to the American commander. They were not used, not for fear of retaliation, but on humanitarian grounds. Instead, explosives and flame were used to dislodge the Japanese. In the end, almost all 21,000 defending troops were killed, and this country suffered 7,000 dead marines and 18,000 other casualties. With gas, the same result would have been obtained on the island, but the airfield would have been intact, and 25,000 American casualties would have been avoided. If the new incapacitating agents had been available, it is conceivable that neither side would have lost any appreciable number of men.

For those who carry the responsibility of planning the defense of this country, there is no real freedom of choice as to whether the United States will pursue research in CBR. The potential is clear, and defense against such agents would be impossible without the most thorough understanding. Antidotes for chemical poisons and serums for diseases yield only to research begun long in advance. In a world which carries the threat of war, the United States does not have the choice of weapons, being committed to a policy of not delivering the first blow. Our need for nuclear weapons is unavoidable, but a strategy based on a single weapon is an invitation to the potential enemy to find a way around such a one-basket approach. And CBR is very likely to be one of the ways around. It probably is not the only one. Therefore, our research in our own protection must be broad based, including greater attention both to CBR and to other possibilities as they open up.

FOREIGN DEVELOPMENTS

By the rules of simple logic, any major nation concerned with its own survival and aware of the potentialities of CBR is going to pursue its study. This would be true of countries on both sides of the Iron Curtain. The committee has also been presented with direct evidence of foreign work in these fields, which for reasons of protecting sources of information cannot be discussed in full detail with the listing of experimental stations, specific tests and materials, and leading scientists. Inherently, much CBR work can be carried on with a minimum risk of detection, and, therefore, even our extensive information is certainly incomplete.

What follows on the Sino-Soviet bloc has been cleared for publication: Their current military forces include over 8 million men, grouped in over 400 ground divisions. The U.S.S.R. alone could mobilize 300 additional divisions in 30 days, or 500 within a year. Within each division is a specific unit devoted to the field of chemical warfare, with chemical troops assigned to all echelons down to battalion level. Soviet chemical weapons are modern and effective, and so is their protective equipment. They are capable of participating in large-scale gas warfare.

Soviet medical and technical reports which have been published show that they are equally well-versed in biological warfare. Their BW tests have been conducted over a long period of time. Their

drug industry is capable of supporting large-scale BW on short notice. Reference has already been made to Soviet awareness of the psychochemicals. Soviet General Drugov has said:

> Many of our scientists * * * regard research on the actions of poisons and on the development of antidotes to be their patriotic duty * * *.

The Soviet Union has large stockpiles of the nerve gas Tabun (GA), as described earlier, following their capture of the German plant and many of its scientists in the closing days of World War II.

A further indication of the seriousness with which the Soviet Union regards CBR is the support given DOSAAF, the well-organized and massive civil defense organization. DOSAAF has set as its goal 20 hours of CBR protective training including practical exercises for the entire population of the country. It sells protective masks at its stores throughout the country. Some 30 million people have already completed training, and are entitled to wear the qualification badge they issue. Detailed reporting on Soviet efforts as published in open sources are to be found in House Report 300, 86th Congress, 1st session, filed by the Committee on Government Operations.

The conclusion is inescapable that the Soviet Union and other Communist countries plan to use CBR if they find it to their advantage. Otherwise, their research effort would not have been continued to large-scale manufacture of materials and delivery devices. This country must make sure that it is not to their advantage to use this form of warfare against us.

STRATEGIC IMPLICATIONS OF CBR

This report has mentioned how the balance of strength has swung between offensive and defensive power; how war has alternated between limited action and objectives and more nearly total involvement and objectives. It has also discussed the importance of strong industrial economies—in the recent past to supply a stream of weapons and supplies in a war of attrition, and today to support the expensive, unending search for new and decisive weapons and their counters.

Until now, nuclear warfare has been a possibility open only to the most powerful industrial nations with advanced technology of a high order. These have been the United States, the U.S.S.R., and the United Kingdom—in the order of their attaining the nuclear capability. But very shortly other nations with advanced attainments in science and technology, but not as powerful in their total capacity to produce goods, will have nuclear capabilities as well. Thus France is almost at this point, and Red China, both Germanys, Sweden, Switzerland, Japan, and others may achieve similar results given a decision to do so. But few of these other countries in the very near future are likely to attain a nuclear capability on a world-decisive scale as the very largest powers have. This is not to say that their capabilities, if misused, could not do a lot of mischief. For example, a nuclear explosion of hostile character might trigger retaliation by a large power against the wrong suspected culprit, and then the fat would really be in the fire. There is always the possibility that extensive atomic plenty may come through some future discovery so that every nation wanting them can build nuclear weapons, even if not always weapons of the same efficiency. This will pose acute problems of international regulation.

The CBR field offers potentially a more dangerous likelihood of international anarchy and the necessity for rethinking strategic concepts. These weapons although requiring considerable additional research to realize their potentialities, are nonetheless relatively attainable at moderate cost by any nation on Earth. The second characteristic which requires particular attention is that they can be used as weapons of stealth. A saboteur within the country or a ship or submarine off the coast under the right conditions could spread sizable amounts of some of these agents, covering thousands of square miles of territory. A third characteristic relates to the ease of hiding the manufacture of very considerable amounts of such materials. The telltale signs which might disclose nuclear experimentation are lacking in chemical and biological weapons, and would be reduced even in some radiological experimentation. An old brewery or a drug house could be the cover for a considerable biological effort, carried on not only in the country planning their use, but in a free enterprise country which was the intended victim.

One can conceive the possibility that a very powerful nation with great industrial resources and standing military forces could be toppled by a latter-day David of a smaller nation by quiet and sustained effort in the CBR field. Only a thoroughgoing research program of our own, coupled with proper attention to warning devices and civil defense will insure that this country is not the Goliath to fall.

RATIONALE OF INCREASED FINANCIAL SUPPORT

Today, CBR research in the United States, essential to teaching us to protect ourselves, is supported at the level of about $35 million to $40 million a year. This represents about one one-thousandth of our defense budget. Responsible elements in the Department of Defense believe that a progressive raising of this support over 2 or 3 years to about $125 million a year would enable the more thorough pursuit of possibilities waiting to be discovered, which they know are under such vigorous attack abroad, particularly in the Iron Curtain countries. If this request were granted, it would still amount to only one-third of 1 percent of the defense budget.

What would this investment buy? It should enable the development and standardization of a range of agents carefully tailored to a whole spectrum of possible uses during the course of the next 5 to 10 years.

The CBR weapons are not a complete answer. They do not replace the nuclear deterrent, and they do not replace the elements of seapower, or the infantryman. But they could readily turn out to be the weapon which toppled a tremendous investment in some previously efficacious strategy. The possibilities which confront us today in this area were virtually unknown 5 or 6 years ago. What may lie in the offing could be even more important.

Research cannot guarantee results in every instance. Perhaps CBR research for another decade would not alter the general military balance of power. But if it does, and the United States has not gained the same capability as others, the cost to the Nation would be beyond calculation.

If the decision is made to prepare CBR weapons as well as to conduct this research, the relatively low incremental cost of these weapons

should be recognized. The tremendous and necessary expense of building missiles, aircraft, and submarines has been undertaken already. It is a comparatively simple matter to put on alternate warheads which carry CBR agents. Although the costs of the agents themselves vary from relatively cheap to quite expensive, they are of a sufficiently different order of magnitude that even a very small nation could contemplate manufacture of some of them.

RECOMMENDATIONS

As a result of its hearings and further study on the problems of research in CBR, this committee offers the following recommendations:

(1) There must be a strong and continuous intelligence effort conducted by the United States as a protective measure to keep abreast of foreign developments in the fields of CBR if this country is to have time to develop adequate passive defense and other countermeasures.

(2) Surveillance of foreign activities might also give this Nation its only inkling of imminent use of CBR against the United States, and therefore is important for this reason, too.

(3) There is an urgent need for greater public understanding of the dangers and uses of CBR if proper support is to be given to our defenses and countermeasures.

(4) In any consideration of international disarmament, a special effort must be made not to overlook the great potential of CBR and the ease of evading detection of CBR activities.

(5) There is an urgent need for a higher level of support on a continuing, longrun basis in order to develop better detection and protection measures against possible employment of CBR against this country.

(6) Civil defense plans of this country should include a more positive effort at providing shelters which are proof against CBR attack, at providing more masks and protective clothing, and in public instruction in defensive measures.

(7) More positive and imaginative attention should be given to the problems of detecting and guarding against use of CBR by saboteurs aimed at disrupting key activities in time of emergency.

(8) The committee views CBR as a weapon which is not competitive with nuclear weapons, but complementary to them, designed to do a different job.

(9) The committee cannot bring itself to describe any weapon of war as "humane," and makes no moral judgment on the possible use of CBR in warfare. It does recognize that ignoring CBR will not remove the problem of its existence or its possible employment against the United States.

(10) It is granted that some forms of CBR offer the prospect and the hope of winning battles without taking human life or destroying homes and factories. If force must be used, this is better than many of the alternatives. But it must also be recognized that even if the United States is attacked with the new "gentle" weapons, the consequences of any defeat for our Nation would be just as dangerous to our national goals and life.

(11) It is also recognized that in the present world situation with other countries pursuing vigorous programs of CBR development, the best immediate guarantee the United States can possess to insure that CBR is not used anywhere against the free world is to have a strong capability in this field, too. This will only come with a stronger program of research.

(12) At the present time, CBR research is supported at a level equivalent to only one one-thousandth of our total defense budget. In light of its potentialities, this committee recommends that serious consideration be given to the request of Defense officials that this support be at least trebled. Only an increase of such size is likely to speed research to a level of attainment compatible with the efforts of the Communist nations.

(13) If CBR is to be considered a deterrent force in the U.S. arsenal of weapons, the program of research advocated here will have to be accompanied by an adequate program of manufacture and deployment of CBR munitions.

(14) CBR warfare is not particularly expensive as compared with many other modern forms of warfare, particularly when considered as an incremental cost added to already necessary delivery techniques employed for nuclear weapons. This is a further reason why this investment must be given careful consideration.

(15) The research being done in CBR has already yielded a variety of peacetime benefits, including antidotes for poisons, new serums to prevent disease, greater understanding of how diseases are spread, new insecticides, and fundamental knowledge of life processes. (See appendix.) There is no real separation possible between potential military application of chemical and biological knowledge and peaceful applications. These peaceful applications are required in any case, and deserve added support for the national welfare.

(16) The United States is in a research and development race, particularly with the Soviet Union, whether it be for peaceful or military purposes. The study by this committee of CBR reinforces our general view of the urgency of the overall race and the necessity of full public understanding and support of science and technology everywhere in our Nation.

APPENDIX

SOME CONTRIBUTIONS TO PUBLIC HEALTH, WELFARE, AND SAFETY

By the U.S. Army Chemical Corps

HEADQUARTERS, DEPARTMENT OF THE ARMY,
OFFICE OF THE CHIEF CHEMICAL OFFICER,
Washington, D.C., August 7, 1958.

CONTRIBUTIONS TO PUBLIC HEALTH, WELFARE AND SAFETY BY U.S. ARMY CHEMICAL CORPS

The U.S. Army Chemical Corps, in the fulfillment of its primary mission, has made and is making valuable contributions to the health, welfare, safety and to the better living of the American people. Many problems solved purely for Chemical Corps purposes have wide peacetime applications as well. Scientists of the U.S. Army Chemical Corps in the pursuit of new developments in the field of chemical, biological, and radiological warfare, have made many discoveries that have far-reaching applications to industry and the public. The Chemical Corps has done much of this research in its own laboratories, but in many instances, it was performed in conjunction with other branches of the military services, Government agencies, or civilian enterprise.

Some of the developments in which the Chemical Corps has participated are listed in the following broad titles.

1. Medicine.
2. Health.
3. Safety.
4. Animal and crop research.
5. Insecticides and rodenticides.
6. Insect repellants and attractants.
7. Antifouling devices.
8. Buildings and equipment.
9. Packaging and container devices.
10. Materials.
11. Miscellaneous.

MEDICINE

ANTIDOTE FOR HEAVY METAL POISONING

Early in World War II intensive investigations were made both in the United States and the United Kingdom to find antidotes to the poisonous action of lewisite, a potent compound containing arsenic. The findings by British scientists that BAL (2, 3 dimercaptopropanol) is effective in ointment form for decontamination of skin against lewisite set the investigators in the Chemical Corps Medical Laboratories to work studying the efficacies of various related chemicals in experimental lewisite poisonings. This work, carried out under the direction of Dr. Alfred Gilman, showed that BAL is the most satisfactory of a large series of related compounds. Dr. Gilman and his group at Army Chemical Center found also that BAL is effective not only in arsenic poisoning but also in mercury and cadmium poisoning.

Widespread clinical studies based on the experimental work at Army Chemical Center have shown that BAL in peanut oil solution injected intramuscularly is effective in the treatment of human poisonings by antimony, arsenic, bismuth, cadmium, chromium, cobalt, gold, mercury, and nickel. It is ineffective in poisoning with lead, selenium, silver, tellurium, thallium, and uranium.

The end result is that research started in connection with Chemical Corps problems has supplied a treatment of great value in preventing death from poisoning by metals like arsenic and mercury, and from other metals like antimony, cadmium, and chromium which may result in industrial poisoning.

NITROGEN MUSTARD FOR TREATMENT OF CANCER

One of the most effective gases used during World War I was known as mustard. It was not a new compound, in that it had been made in laboratories as early as 1860. An incident in the harbor at Bari, Italy, during World War II involved the blowing up of a boat loaded with liquid mustard. The released liquid became mixed with fuel oil and floated on the water. Men swimming in the water were contaminated by the mustard; many became severe casualties. The doctors reported that the injured were in a state of shock and that they did not respond to treatment. The patients were found to have a reduction in white blood corpuscles.

Later at the Army Chemical Center, the same effects were reproduced in test animals. It became apparent that the reduction in white blood cells was caused by the mustard. Chemical Corps scientists saw the possibility that this agent might benefit in the treatment of diseases in which there was an abnormal increase in white blood cells. Mustard type agents, especially the nitrogen mustards, were tried on diseases of this type. They were used in cases of Hodgkins disease, lymphosarcoma, and leukemia. The nitrogen mustards do not cure any form of cancer, but they do prolong life in many instances. Today, hospitals, clinics, and laboratories throughout the Nation are studying the mustard compounds as a possible treatment for some forms of cancer.

ORONASAL MASK

A new, more effective type of oronasal air filtering mask (one which covers the nose and mouth of the wearer) has been developed by the Army Chemical Corps.

The mask was designed primarily for use in testing the filtering efficiency of experimental biological and chemical warfare protective masks. It has been used for several years and has proved physically rugged without deteriorating after prolonged wearing. Because of this and the high stopping efficiency of the filter, it appears that the mask may be suitable for a wide variety of other uses.

The new mask has proved to be 10 to 15 times more effective in filtering out airborne bacteria than the conventional surgical mask.

The oronasal mask is designed for simplicity of manufacture and low cost. It is held to the face of the wearer by a flat sheet of surgical-type adhesive tape designed to form an airtight seal against the curve of the face. The filter material, also developed by the Army Chemical Corps, is waterproof and consequently, condensed moisture from the breath of the wearer does not affect its performance. The filter is pleated to increase its area in order tc lessen its resistance to breathing, yet it does not interfere with normal face movements or speech. Unlike conventional contagion masks, it does not fog the lenses of persons wearing glasses.

Extensive laboratory use and field trials with troops indicate that skin irritation from prolonged wearing is virtually nonexistent. Some skin irritation may be encountered from the tape, however, when the mask must be replaced frequently.

Possible applications for its use are as a contagion mask to prevent exposure to toxic bacteria or when environmental sterility is mandatory, as a dust mask, an emergency mask, or (after slight alteration in manufacturing techniques) as an odor protection mask.

The new mask was designed by Mr. Charles J. Shoemaker and associates, in the Protective Development Division, Chemical Warfare Laboratories.

CLINICAL VALUE OF DFP AND RELATED COMPOUNDS

The interest of the Chemical Corps in controlling convulsions that may result from nerve gas poisoning has resulted in the testing of a large number of drugs developed by chemists and pharmacologists.

Work in the laboratories of the Chemical Corps and in universities has led to the use of DFP, a chemical compound similar to nerve gas, in relieving the pressure that occurs in the eyeballs of people with glaucoma, a serious disease often leading to blindness. This and similar compounds known to the Chemical Corps

and their associates are additional drugs useful to eye specialists in treating this disease.

DFP has proven to be effective also in overcoming partial paralysis of the urinary bladder and the intestines that may occur in patients after operations and following debilitating diseases that confine people to bed. Laboratory studies have done much to point out the probable usefulness of these materials in medicine.

A chronic, fatal disease, myasthenia gravis, that is characterized by weakness of the muscles, has frequently been benefited by the use of TEPP and OMPA and related materials by strengthening some victims of this disease over longer periods than was possible with the previously used, short-acting drugs. They can be used in combination with older drugs, often to the advantage of the patient. Considerable work of this type has been supported by the Chemical Corps to its own advantage as well as to medicine.

The advantages gained by medicine from research carried out under the auspices of the Chemical Corps are based on fundamental studies having wide horizons. Work with these materials has facilitated research designed to understand the way in which the nervous system functions in health and disease. Controlled experimental inhibition of the cholinesterase enzymes with these compounds has provided scientists with an important tool with which to study the nervous system. In connection with the study of the basic functions of nerve tissues, DFP was found to be one of the compounds which could inhibit these enzymes. It has for some time been postulated that they played an essential role in the transmission of nerve impulses, but proof was lacking due to the absence of a drug which could inactivate such enzymes. Demonstration of this property of DFP by Chemical Corps scientists and associates and their subsequent nerve studies have excited worldwide interest.

BOTULINUM TOXOID

Preparation of a combined toxoid to immunize against the five known types of botulinum toxin is now possible. This disease is caused by a poisonous substance called botulinum toxin which is formed by a type of bacteria that grows in improperly processed foods. In tests conducted at Fort Detrick, guinea pigs and rabbits were successfully immunized with the preparation. Current information now indicates that this toxoid will be successful for use with humans. However, this is the first time that a purified toxoid capable of simultaneously immunizing against all five known types of botulinum poisoning has been developed.

The disease, though now relatively rare in humans in this day of modern food processing techniques, nonetheless does occur in areas where home canning is still done. In instances where food is improperly canned, the bacillus will form the toxin, hence the disease can occur in persons who eat the contaminated food, with death resulting in 40 to 50 percent of the cases. Botulism often affects animals (cattle, horses, sheep, fowl)—sometimes in epidemic proportions.

TUBERCULIN TESTING OF MONKEYS EXPERIMENTALLY INFECTED WITH AEROSOLS OF TUBERCLE BACILLI

The fact that negative skin tests cannot be assumed to indicate an absence of tuberculosis gained further proof in a study made by four scientists from the U.S. Army Chemical Corps Biological Laboratories, Fort Detrick, Md.

Ten healthy rhesus monkeys were infected with aerosols of tuberculosis bacilli at a dose level of 100 organisms per animal. The monkeys were then tuberculin tested by injection of tuberculin into the skin of the upper eyelid of the animals. Traditionally, the animal is said to be positive for tuberculosis if the injected skin site becomes red and swollen and negative if no skin reaction occurs. Common opinion is that a positive skin test is 90 percent reliable and that a negative reaction is always reliable.

The Fort Detrick experiments indicated that even the negative tuberculin skin test cannot be accepted as certain indication that a monkey is free from tuberculosis. Further tests remained negative, even though 3 months after exposure, X-ray evidence indicated that all the animals had lung lesions resembling tuberculosis.

Just why the tuberculin tests on the monkeys failed to show that they did, in fact, have tuberculosis has not been determined. It is believed, however, that factors such as the number and size of the inhaled germ-containing particles, and where they are deposited within the animals, may hold some of the reasons. Likewise, the method and the amount of spread of the tubercule bacilli from the lung to the other body organs can also be a contributing factor.

The results of these tests will be of considerable value to scientists working with tuberculosis since it was shown that the negative tuberculin skin test can occur in monkeys despite the fact that they have the disease.

PROPAGATION AND STUDY OF MAMMALIAN CELLS

An essential element in the production of viral vaccines, such as the well-known Salk vaccine, is the production of cells by tissue culture methods. Scientists from the University of Pennsylvania under the auspices of the Chemical Corps have developed a new technique for growing mammalian tissue cells on a large scale.

Utilizing a type of membranous plastic sheet wrapping, familiar to the housewife, this new technique facilitates the isolation of individual cells for nutritional studies. Later experimentation with the plastic sheeting has led to its use in viral and cell transformation studies. Up until the present time cells have been grown on glass surfaces of flasks, petri dishes, and test tubes.

Larger quantities of viral vaccines and hormones can now be produced from a given amount of original cell tissue by the use of 10-gallon stainless fermentor tanks. The fermentor equipment is the type used in the fermentation industry for the production of antibiotics.

From a practical standpoint, such large-scale production should result in considerable savings to commercial producers of vaccines. They can now produce cell growths in fermentors as large as those used in the commercial production of antibiotics.

ANTHRAX VACCINES

An anthrax vaccine suitable for use in man has been developed. Anthrax, a disease of domestic animals, occasionally affects man, particularly those working in the wool and tanning industries. The live spore vaccine developed by Louis Pasteur has not been satisfactory for immunizing man. During and after World War II scientists at Fort Detrick and their colleagues in England developed a soluble vaccine containing no living material which can be produced in protein-free media. This vaccine can be used safely in man. For his work in developing the vaccine, Dr. George G. Wright of the Army Biological Laboratories at Fort Detrick received the Army's highest award to civilians, the Exceptional Civilian Service Award.

ARMY DEVELOPS AUTOMATIC DEVICE FOR COUNTING BACTERIA

A new device has been developed by the Army Chemical Corps to automatically count bacterial colonies, thereby aiding bacteriologists in one of their most tedious and time-consuming tasks.

The electronic instrument, representing a new attack on an old problem is a product of the Chemical Corps Biological Warfare Laboratories.

Much biological research progress is dependent on accurate quantitative methods, but achievement by such methods is frequently costly and time consuming.

Bacteriologists have long used two largely dissimilar techniques for the quantitative estimation of bacterial numbers, one depending on spreading out a small quantity of fluid containing bacteria onto a solid surface of agar—a gelatinlike substance—in a 3½-inch petri plate; the other involving the culturing of several liquid samples in laboratory test tubes.

Through a contract with Dumont Laboratories, Clifton, N.J., Chemical Corps Biological Laboratories has supported the development of a device employing the first principle, the automatic colony counter, based on a British announced method of electronic operation.

In this method, fluid containing bacteria is spread out thinly over the agar surface, largely separating the individual bacteria, just as presently is done for visual counting. When the plate is next incubated for 12 to 72 hours, each isolated "seeded" bacterium gives rise to a visible colony. Counting of these colonies is a standard practice in bacteriological laboratories, but is a tedious, time-consuming operation. Visual counting time depends upon the number of colonies on a given dish. The automatic colony counter yields a total in 1 second.

The device functions by scanning the surface of the incubated petri plate with a minute ray or "pencil" of light from a cathode ray tube. The ray moves across the petri dish 1,000 times per second, completely scanning the agar surface by advancing 0.0035 inches (about the width of a hair) for each line of scan. Changes in optical density between the transparent agar and the opaque colonies are recognized by a multiplier phototube.

The operating secret of the device lies in the action of its "memory"—a quartz ultrasonic delay line—which keeps track of the details of the previous tour of the scanning pencil across the dish in relation to its current scan. Electronic circuits compare these two records to determine which colonies are being encountered for the first time. Each new colony is counted in the registers of the machine. Repeated scans of a previously recognized colony are canceled out by the comparing circuits and hence not counted. While the process is subject to some error in that touching colonies, debris, bubbles, or cracks in the agar, and so on, may cause gain or loss of a few counts, these sources of error are not large in relation to the other "experimental errors" inherent in biological research.

It is expected to find other areas of optimum use for this automatic colony counter. For instance, counting of metallurgical specimens, and other small objects might be done by the automatic colony counter approach.

BAT-VIRUS RELATIONSHIP STUDIES

The problem of the susceptibility of bats to viruses is being explored by scientists of the Army Chemical Corps Biological Warfare Laboratories, Fort Detrick, Md., and their colleagues.

Basic research has shown that bats when inoculated with either Venezuelan equine encephalomyelitis or Japanese B encephalitis build up an extremely high concentration of the virus but do not develop symptoms of the disease. This immune response of a host is unusual in virology. The bat is one of the few animals known to build up a high concentration of the virus over a 3-day period, maintain this concentration for a maximum of 26 days, and then it seemingly disappears.

The solution to the problem of how the bat continues to remain immune and what happens to the virus after the 26 days may possibly lead to new immunization techniques.

One presumption is that when mosquitoes and bats have a common habitat the mosquitoes might transmit the virus from bats to humans and vice versa. A mosquito could inoculate a bat with a relatively harmless concentration of the virus. Three days later it could take from the bat a high concentration so that upon biting either man or animal they could become infected. The bat would then be acting as a reservoir for the virus.

Further study on other viruses to determine if bats react to them in the same manner is being made. Although bats are more closely related to primates than to other orders on the evolutionary scale, investigators feel that bats may generally have been overlooked as valuable laboratory animals.

Health

MILITARY CHEMICALS HEALTH HAZARDS PROGRAM

In 1949, the Chemical Corps Technical Committee initiated a program to study the health hazards of various military chemicals at the request of several technical agencies in the Army, Navy, and Air Force, and with financial support from these agencies.

Among the materials investigated were fire extinguishants such as monochloromonobromomethane, difluorodibromomethane, and trifluoromonobromomethane; propellant fuels like aniline, furfural alcohol, ethylene oxide, n-propyl nitrate, hydrazine, methylhydrazine, dimethylhydrazine, JP3, JP4, diborane, pentaborane, and other boron hydrides; lubricating oils like sebacate, azelate, adipate, and pelargonate esters; and jet-assist takeoff exhausts. There were also many other items.

The results of these experiments have many uses. In some cases, they serve as a basis for the substitution of a highly toxic compound by less toxic substances; in other cases, the information guides the using agencies to adopt procedures so that toxic injury to personnel handling these chemicals may be minimized.

Industries producing fire extinguishants and lubricating oils have made use of these studies to protect users and handlers of chemicals from toxic effects, to develop less toxic compounds wherever possible, and to develop therapy for use in case of accidental poisoning.

METHOD FOR DETECTING MINUTE QUANTITIES OF CYANIDE

In connection with studies of Tabun, a nerve gas containing the cyanide radical, an existing spot test for cyanide ion and cyanogen chloride was converted by

Chemical Corps personnel into a sensitive method for quantitatively estimating minute concentrations of cyanide ion or cyanogen chloride. This quick and simple test has been adapted for use in the microdetermination of cyanides in seeds, in water, in waste samples, and in the manufacture of vitamins.

Public health agencies, silver-plating companies, coke plants, companies producing fertilizer by nitrogen fixation process, petroleum refining industries, manufacturers of certain kinds of papers, and many others use this process for the measurement of cyanide in industrial wastes. Manufacturers of vitamin products use it to measure the exact amount of cyanide in vitamin B_{12}. Cyanide is used in the manufacture of this vitamin.

SHELLFISH POISONING

The paralytic poisoning in man often caused by eating toxic clams and mussels was isolated in relatively pure form from clam and mussel tissues by the Chemistry Branch at Fort Detrick in collaboration with Canadian associates in 1954. The isolation of this product in purified form has been of great value to the U.S. Public Health Service, Food and Drug Administration, and commercial shellfish interests. The purified poison is now used internationally as a standard in the bioassay for the poison in shellfish products. Previous to the isolation of the purified poison, no reference standard was available and considerable difficulty arose mainly from the fact that the bioassay was interpreted differently in each country and even in different laboratories in the same country. As a result, commercial shipments of shellfish products to the United States from Canada, Alaska, and in some cases from Japan were prohibited from sale in the United States by the Food and Drug Administration. The use of the purified poison for standardization of the assay in different laboratories has brought about a much greater reliance in the bioassay.

USE OF RADIOACTIVE ISOTOPES FOR TRACING MOVEMENT OF INSECTS

Biochemists at Army Chemical Corps Medical Laboratories needed to know the effects of certain toxics on carbohydrate metabolism, and wished to use C_{14}-labeled glucose in these studies. The immediate problem was to find a source of radioactive glucose for the metabolism experiments.

Initial attempts were made to obtain this radioactive compound in an atmosphere of C_{14}. This proved slow and unrewarding. Meanwhile, entomologists in the laboratory had reported that 5 percent of the weight of some insects was glycogen, a compound easily converted into glucose. This led to the idea that insects could be put to work for the biochemist, in synthesizing radioactive glycogen.

Vinegar flies were made radioactive and the glycogen extracted from them was also found to be radioactive. Entomologists at the laboratory had long been aware that there was need for a good system for marking insects, in order to study their flight range and dispersal patterns—an important factor in the control of insect-borne diseases. The method currently in use was to spray insects either with a metal powder or a dye and release them. This method had two distinct disadvantages, the spray decreased the flying ability of the insect, and the collection and examination of each insect under a lens was tedious work.

By adding a radioactive substance to the larval diet, the insect could be tagged. The larvae fed on this radioactive food and grew into radioactive adults. The "hot" insects could easily be detected by the use of an ordinary Geiger counter. This method was field tested by the medical laboratories in the Hudson Bay area of Canada. It proved to be so successful that it is now in general use for tracing movements of insects, thus contributing materially to the study of insect-borne diseases.

BETA-PROPIOLACTONE VAPOR AS A DISINFECTANT

Methods for use of a gaseous disinfectant with valuable sterilizing properties, have been developed by Fort Detrick scientists. Known as beta-propiolactone, this gas may provide an improved method for sterilization of rooms, or even entire buildings. Its use in hospitals and nurseries is a possibility.

At Fort Detrick, a 50,000-cubic-foot building was successfully sterilized in 2 hours with the substance, simply by spraying it into the building in an aerosol form. After opening all the doors and windows to allow for ventilation of the building, workers could again enter the building and resume normal work the following day.

Gaseous disinfection is a highly important method for rendering material and equipment germ free that would be damaged or destroyed if sterilized by heat or

liquid disinfectants. Gases can be used with little if any damage to many material objects. In situations involving contamination of entire enclosures or structures, gaseous sterilization is a practical answer.

To date, formaldehyde gas and ethylene oxide have been the two most effective gaseous sterilants. Beta-propiolactone is not as highly penetrating as ethylene oxide and is not recommended to replace the latter as the best disinfectant for such things as clothing, bedding, books, drugs, delicate equipment, and the like. Moreover, it is less effective in a dry atmosphere. Beta-propiolactone does have most of the germ-killing qualities of gaseous formaldehyde, yet does not have the same undesirable side effects. It acts more rapidly, is more effective at lower temperatures, and is more easily removed by simple aeration.

IMPROVED CATHETER FOR USE IN TREATMENT OF "BLUE BABIES"

From time to time a child may be born with a congenital defect in the structure of the heart. Because of the distinctive bluish color which this condition imparts to the skin, these babies are known as blue babies. Successful operations have been performed on these babies at Johns Hopkins Hospital and elsewhere since 1945. One of the preoperative tests consisted of catherization of the various chambers of the heart and its major blood vessels to withdraw sufficient blood to determine the amount of oxygen in the blood. The catheter, however, presented some difficulty, since its necessary flexibility made it extremely difficult to guide. In addition, once the catheter was in place, suction applied to withdraw blood frequently caused the tissues to adhere to the tiny hole in the tip of the catheter, blocking the passage of blood.

Since catherization has been used in the course of Chemical Corps experimentation, several of its scientists who had encountered the same difficulty, attempted improvement of the existing item. Two additional holes were placed approximately 2 millimeters from the tip of the tube to prevent the blocking of the tube. A new type of tube was tested that tapered from a comparatively large, easily handled tube to a narrow tip. The tube was rigid to within 5 millimeters of the tip thereby allowing the physician greater ease in handling.

It must be emphasized that though the Chemical Corps did not develop the "blue baby" operation, it did contribute materially through the development of the improved catheter to help countless children not only to a better life through this operation, but to save life itself.

SLIT-INCUBATOR SAMPLER

A new slit sampler developed by Chemical Corps scientists will permit a more exact means of determining the germ content of the air for given times in locations where diseases have been transmitted by suspected airborne routes. The instrument will be a valuable addition to research work in laboratories, hospitals, and civil defense agencies. Hospitals can more readily monitor the air and conduct epidemiological studies on the spread of infectious organisms that occasionally occur in certain areas.

Slit samplers have been previously used for periods up to 12 hours, but with low collection efficiency. The new slit-incubator sampler permits collection of air samples at a rate of one-half-cubic-foot per minute, for periods up to 12 hours at a much higher degree of accuracy.

A unique feature of the new sampler is the incorporation of an incubator chamber which provides an optimum growth temperature for the organism collected, without removal from the sampling device. This is a feature not previously included in the design of air samplers and eliminates the need of personnel transferring the sampling tray to large incubators.

MEMBRANE FILTER

The development of the membrane filter took advantage of basic work done by the Germans before and during World War II. The membrane filter consists of a thin film of cellulose esters cast in such a way that about 80 percent of its volume is composed of voids or pores of remarkable uniformity. It has decided advantages over the other ultrafine filters which have previously been developed. First, filtration can be performed much more rapidly and, second, retention is on the surface rather than within the body of the filter itself. The greatest advantage of this filter lies in the field of bacteriology, since microorganisms which are collected quantitatively on its surface can be cultured in situ merely by placing the filter on suitable nutrient media and incubating.

The American Public Health Association has approved as an alternate method the employment of the membrane filter for the bacteriological testing of public water supplies.

The National Dairy Research Laboratories, Inc., has reported methods of application of the membrane filter for the evaluation of sanitary conditions of dairy plants and their equipment.

AEROSOLOSCOPE

An electronic instrument that measures and counts microscopic airborne germs, dust, and moisture particles at the rate of 100 per second has been developed by the Chemical Corps. This device, known as an aerosoloscope, will not only be helpful to scientists analyzing contaminated air but also to such industries as flour mills, cosmetic producers, paint factories measuring minute pigment particles, and other organizations vitally concerned with particle-size control or control of airborne contaminants.

The basic principle of the aerosoloscope is relatively simple. It is based on the phenomenon that the dust particles or specks observed in a shaft of light are in fact only reflections of the particles themselves. As airborne particles in concentrations of up to 15,000 per milliliter pass through the instrument, they are diluted and their flow rate is controlled in such a way that each one is individually illuminated. The reflection caused by the illumination is detected by a photomultiplier tube. Since large particles reflect more light than small ones, the photomultiplier tube, in conjunction with other electronic apparatus, is able to determine the size of each particle. Electrical impulses are transmitted to a set of 12 dials representing 12 different ranges of particle size. Each dial indicates a total of the particles of that size. As constructed, the aerosoloscope measures particles from 1 micron to 64 microns, but it can be modified to detect smaller particles if necessary.

THE ANDERSEN SAMPLER

A device which collects and identifies airborne pathogens and automatically separates them into size categories, completely covering the microscopic range, has been invented by a civilian scientist of the U.S. Army Chemical Corps.

Known as the Andersen sampler, the device takes its name from the inventor, Dr. Ariel A. Andersen of the U.S. Army Chemical Corps Proving Ground at Dugway, Utah. It has already proved useful in air pollution studies in public health and industrial hygiene. It is extremely sensitive, and Dr. Andersen sees usefulness for it in the detection of disease-producing organisms in the air of hospitals, schools, and other public places.

Up to the present time, the all-glass impinger has been the most widely used aerosol sampling device developed for bacteriological work.

It is known that the capacity of a pathogenic cloud to produce infection in exposed animals depends upon the size and number of viable particles per unit volume in air. The all-glass impinger counts only the cells making up the particles and both the size and the count of the viable particles are lost.

The Andersen sampler not only determines the number of viable particles in an aerosol but accurately separates the particles into their various size ranges as well. This makes it possible to correlate the number and size of viable particles in a pathogenic aerosol and the amount of animal infection produced.

With the Andersen device there is no loss in viability of particles from the aerosol collected because the particles are impinged directly upon the culture medium, where they start to grow at once. None of the particles are lost on the inner surfaces of the sampler or on the walls of the Petri dishes rather than on the culture medium. In the glass impinger there is a considerable loss of viable particles.

The sensitivity of the Andersen sampler has been demonstrated in field tests where no organisms were detected by the all-glass impinger. At one Army installation many attempts to isolate Coccidioides Immitis (which causes Valley or San Joaquin fever) were unsuccessful, until the Andersen sampler was tried. The sampler also proved effective in an outbreak of ornithosis in humans by demonstrating that a rendering plant processing diseases turkey carcasses was contaminating air with disease germs and was responsible for the cases in and near the plant.

Compared with the all-glass impinger, the Andersen sampler saves both labor and expense. Because there is no plating process, there is a saving of many man-hours in the elimination of manifold dishwashing and glassware sterilization. While a little more time may be required for counting with the sampler,

considerable savings are realized in labor and materials, and results are obtained sooner.

Dr. Andersen, the inventor of the device, has had more than 25 years of experience in several broad fields of research in bacteriology and has published numerous articles in scientific periodicals. The sampler was developed and perfected in the research laboratories at Dugway Proving Ground as an official Government project.

SAFETY

HOLGER NIELSEN ARTIFICIAL RESPIRATION

In searching for a method for treatment of nerve gas poisoning, the Chemical Corps aided in popularizing a new method of artificial respiration. One of the charasteristics of nerve gas is that it attacks the body by interfering with the passage of nervous impulses between the nerve endings and the muscles they control. Among the first areas attacked by the gas are the muscles that control the expansion and contraction of the chest. First aid for nerve gas victims usually consists of injections of atropine and the application of artificial respiration—if the victim has stopped breathing.

The Schaeffer prone-pressure method operated on the principle of forcing the air out of the lungs and the elastic recoil made the lungs draw in fresh air. Since a victim of nerve gas poisoning no longer had any control over the movement of the lungs, a new method was sought.

Under a joint Army-Navy-Air Force project, with the Chemical Corps serving as the coordinating agency, a search for a better method was instituted. After exhaustive studies and trials had been conducted, it was found that a little known method of manual artificial respiration invented by a Danish Army officer, Lt. Col. Holger Nielsen in 1905, might be the answer. His method had been in limited use in the Scandinavian countries for years. Studies showed that his method induced anywhere from 10 to 30 percent more fresh air into the victim's lungs through an involuntary sucking-in action. The studies also showed that it was less tiring on the operator.

This method was officially adopted as standard in the Department of Defense late in 1951 and within a few months the American Red Cross, the Boy Scouts, the Bureau of Mines, and other Government, civilian, and commercial agencies followed suit.

Thus, in searching for a method to reduce the effectiveness of nerve gas in claiming victims, the Chemical Corps aided in calling attention to a new means of artificial respiration known as the back pressure arm-lift method or the Holger Nielsen method which became generally adopted.

STERILIZATION OF SEWAGE BY IRRADIATION

The Armour Research Foundation, Chicago, Ill., under a contract with the Army Chemical Corps Biological Warfare Laboratories has been investigating the possibilities of sterilizing sewage by irradiation. From the work accomplished to date, it has been concluded that sterilization by irradiation might aid in solving stream and river pollution problems.

The work consisted of a technical and economical evaluation of the potentialities of sterilizing sewage overflow rates ranging from 5 to 1,000 gallons per minute. The bacteriological effectiveness was studied and estimates were made of costs, practicability, and probable operating problems.

In general, it was concluded that a reactor operating on enriched uranium would be applicable and that sewage could be used as a secondary coolant. This requires that the sewage would not pass through the reactor core, but probably would pass between the reflector and the thermal shield. From work accomplished to date it does not appear that neutron activation of sewage will present any public health hazard and that use of a nuclear reactor is a most promising radiation method for sterilizing sewage.

INFRARED ALARM (LOPAIR)

An infrared "eye" that will flash a warning light and sound a horn when a very small amount of contamination is in the air as much as one-quarter of a mile away has been developed by the Chemical Corps. Intended primarily for use by troops in the field, this instrument is known as lopair (for long path infrared). Lopair will detect contaminants even if they are colorless and invisible to the naked eye.

Lopair can be used in air pollution studies and for control of stack gases from

industrial establishments. The system can detect and measure almost any substance by its characteristic infrared spectrum. Once the alarm has been properly set to detect one specific substance, it will normally not be set off by other materials likely to be present. A special design feature also prevents the alarm sounding even though a person, animal, or vehicle breaks the beam between the two units.

The current model of the alarm consists of two separate parts. One unit, called the detector head, which is mounted on a tripod, contains the source of infrared light, a mirror that directs the beam along a path, and a detector to analyze the beam when it returns. The other unit, which may be mounted on a special self-alining mirror that is placed at the other end of the path and returns the beam to the detector. The detector part weighs 39 pounds, and the mirror unit weighs 15 pounds. Storage batteries supply the power.

HALOGEN ALARM

Army Chemical Corps use of chlorine in large quantities introduced a requirement for a warning alarm. Commercial devices proved inadequate since they were either too expensive; insufficiently sensitive; overly sensitive, reacting to other materials as well as chlorine; or required excessive maintenance.

An alarm, sensitive only to halogens, was developed by the corps, based upon the reaction of any halogen with sodium or potassium hydroxides. Disintegration of the resultant compound yields sufficient energy to activate an alarm.

The new alarm, which is capable of detecting a fraction of a part per million of chlorine in the atmosphere, is extremely simple. It consists of a small pump, a plastic cell containing a silver nitrate cell to create electrical energy, an electronic amplifier system, and alarm lights and bells. Engineering effort is continuing to increase ruggedness so that the alarm may be used on a moving vehicle.

This halogen alarm should have wide application in industry wherever chlorine is used on a large scale.

THE BASEBALL GRENADE

The M25A1 baseball type tear gas grenade is a Chemical Corps development having obvious and direct peacetime applications. In the event of riots, mob demonstrations and other civilian disturbances it may be used by law-enforcement agencies with less danger of fragmentation. The metal grenade previously used often caused injuries from flying fragments of the casing. This plastic grenade is much lighter and can be thrown farther and with greater accuracy. It is approximately the size, shape, and weight of a baseball. It is timed to burst about 2 seconds after throwing, thus giving practically no time for the intended recipients to pick up the unexploded missile and throw it back. Its filling of powdered chloracetophenone (CN) eliminates fire hazards encountered with other tear gas agents. It emits no visible cloud to warn the would-be rioters. Upon bursting, there is only a short-lived, small gray cloud which quickly disappears.

FIBER DIFFUSION BOARDS

The Chemical Corps, in conjunction with the Forest Products Laboratory of the Department of Agriculture, has developed a cheap and effective means to aid in the protection of families against biological and chemical warfare attack. This is known as the fiber diffusion board. Somewhat like fiberboard, but having charcoal and other added components, the material could be manufactured commercially in large quantities. It would cost only slightly more than fiberboard and could be used for the construction of small shelters or as a liner in existing shelters. This puts a means of protection within the reach of families and other small groups.

The board is so constructed that air diffuses through it, with the material acting as a filter to take out solid particles, droplets, and liquids or vapors of toxic agents. Shelters constructed of this board would act as a barrier for toxic particles but would allow clear air to pass through. Where the breathing of the occupants of small enclosed shelters of this type would ordinarily cause a hazardous accumulation of carbon dioxide, a special feature of the fiber diffusion board allows carbon dioxide and water vapor to diffuse to the outside. Approximately one square yard of this board would provide enough breathable air for one man for an extended period of time.

This board is capable of filtering out atomic or radioactive dust. It does not afford protection against direct radiation from an atomic blast. Like wallboard, the fiber diffusion board can be planed, sawed, and nailed.

INFANT PROTECTOR

The Chemical Corps, in quest of a protection against toxicological agents for infants of military and civilian personnel employed at Military Establishments, has designed the infant protector. This project was carried out in collaboration with the Federal Civil Defense Administration, now the Office of Civil and Defense Mobilization.

This device is essentially a portable protective enclosure into which infants and small children can be placed to provide them with protection against toxicological agents. It is an elongated tentlike structure, triangular in cross-section, fabricated from flexible vinyl plastic film and supported by an easily erected metal frame. Necessary oxygen, carbon dioxide, and moisture interchange between the inside and outside of the protector and detoxification of the entering air are accomplished by means of panels of gas-aerosol filter materials permanently installed in the slanted sidewalls. A slide-opening gusset with roll closure is used for inserting the child and subsequently sealing the protector. One of the sidewalls is fitted with a clear plastic window to provide good vision for the child and for the attendant. A baglike extension projects from one end of the protector to accommodate the feet of larger children. A carrying strap is attached to the top members of the metal frame. For storage purposes, the protector can be folded into a flat rectangular shape and slipped into a flat case which is provided to contain the item and protect it from moisture and contamination. Instructions for use of the protector are imprinted on the outside of the case which is also made of vinyl plastic film.

The civil defense model is similar to the Army model.

CARBON MONOXIDE MASK

Due to its prevalence, insidious properties, and the difficulty of protecting against it, carbon monoxide is one of the most dangerous industrial poisons It cannot be used in warfare directly as a gas due to its physical properties, but it enters into the manufacture of some gases like phosgene ($COCl_2$), and it was often encountered in wartime whenever explosives were detonated in enclosed spaces. Carbon monoxide is a product of the incomplete combustion of all fuels and is a constituent of illuminating gas as well as of the exhaust gases of gasoline engines. Its character and effect are equally deadly in war and peace It combines avidly with the hemoglobin of the blood and prevents its oxygenation in the lungs.

Many years ago the Navy Department requested the development of a mask with a self-contained canister for protection against carbon monoxide in submarines. At that time the only practical device for this purpose was the oxygen helmet and hose mask whose bulk handicapped the wearer

Carbon monoxide is difficult to remove from the air. Due to its high volatility it is difficult to absorb. It is chemically inert and has very low solubility in solvents, two factors which increase the difficulty of protection. Since the inhaled air in a mask is only in contact with the absorbent for a short time, the absorbent must react very quickly with the carbon monoxide under all possible conditions of temperature and pressure. In addition, the carbon monoxide absorbent must be reasonably hard, offer moderate breathing resistance, and be capable of quantity production.

The Chemical Corps devised a mask to meet these rigid requirements, and it was adopted by the Navy for submarine crews and by many industrial firms. Most of the commercial carbon monoxide masks can trace their lineage back to this model.

AMMONIA CANISTER

Ammonia fumes are encountered most frequently in ice plants and in handling cylinders, but they are also potential hazards in firefighting and in miscellaneous chemical plant operations. Inasmuch as the wartime protective mask canister did not afford satisfactory protection against ammonia, the help of the Chemical Corps was sought to develop a special canister to effectively absorb ammonia.

The ammonia canister is very similar to the war canister in appearance. It affords complete protection against low concentrations of ammonia for a considerable period of time. The silica gel absorbent has several times the absorptive capacity for ammonia as the military canister. An uncomfortable skin irritation would give ample warning of the presence of a higher concentration of ammonia than the canister could be effective against; however, the canister would protect the wearer for a longer time than the skin irritation could be tolerated.

A small amount of ammonia detected through the mask serves as a warning that the canister is nearly exhausted. The amount which penetrated is usually in small amounts for some time, so that the wearer of the mask is not in any immediate danger and doesn't need to move out of the locality for some time.

CIVILIAN PROTECTIVE MASK

Since part of the mission of the Army is the protection of civilian dependents of military personnel, and of civilian personnel employed at military establishments, it was necessary to develop a civilian protective mask that would provide reasonable protection against vapors and aerosols of chemical warfare agents and substantially complete protection against biological and radiological warfare aerosols in the event of toxicological warfare. The mask is of simple construction and can be cheaply mass produced. Work on this was done in conjunction with the Department of Health, Education, and Welfare and the Federal Civil Defense Administration, now Office of Civil and Defense Mobilization.

SAFETY GLASS

The standard material prescribed for safety glasses and goggles in Government and industry is hardened "safety" glass. Tests conducted by the Chemical Corps in cooperation with the Air Force have shown that particles smaller than 1 millimeter in diameter will penetrate hardened glass at lower speeds than are required to penetrate unhardened glass. The smaller missiles released the stress inherent in hardened glass and caused it to shatter.

Previous efforts to test the effects of small particles at high speed had not been successful because adequate testing equipment was not available. A special "gun" was designed by Chemical Corps personnel using helium for the propellant and hypodermic needle tubing for the gun barrel. This arrangement gave sufficient control of the speed and aimability of the particles to conduct the tests.

The results of these tests can materially affect safety practices, both in industry and Government. Any industry whose employees do metal chipping, riveting, welding, lathe operations, or anything in which there is danger from flying particles, will benefit from the information gained in these tests.

HEALTH HAZARDS OF MODERN FUELS

The research of Chemical Corps scientists is paving the way for formulation of safety procedures in handling the newer and more dangerous fuels and oxidizers and in simple rules of first aid and treatment which will protect the health and lives of those working with these highly combustible materials

Not only do these new fuels provide far more powerful explosive combinations, but in themselves they may be very poisonous when splashed on the skin or eyes or when inhaled. In many instances these fuels and oxidizers and their decomposition products are poisonous, and conditions attending their use may present hazards to personnel. The Chemical Corps Medical Laboratories have had long experience in studying the toxic potentialities of chemical substances, in learning how to avoid dangerous contact, and the treatment measures to be taken in case of exposure to them. With the advent of these newer duel requirements, Chemical Corps scientists are playing a leading role in applying their techniques to the study of toxic aspects of propellants and in educating the public to the health hazards involved.

Animal and Crop Research

PLANT GROWTH REGULATOR—GIBBERELLIN

Initial work on Gibberellin, a plant growth regulator, was done in the United States by Army Chemical Corps scientists. This product is now being commercially exploited. Gibberellin is extensively used in the production of seed and is now being used commercially. Retail outlets are seed stores, garden supply stores, etc. Use by amateur and professional gardeners is increasing. Gibberellin stimulates root formation and general growth.

WHEAT RUST

The Chemical Corps has cooperated with the Department of Agriculture and the British in conducting studies on the evaluation of the world collection of wheat varieties and endemic rust races. More than 10,000 varieties of wheat

were grown, and their resistance to the prevalent rust races was measured. Evaluation of this information has disclosed that certain varieties, including those indigenous in Kenya, British East Africa, show remarkable resistance to rust races related to race 15B; the race that has caused much damage to U.S. spring wheat in recent years. The introduction of these rust-resistant lines of germ plasm into wheat-breeding programs currently being carried out by Department of Agriculture and State Experiment Station workers is a definite contribution to our agricultural economy.

CHEMICAL DEFOLIANTS

Research on chemical defoliants has shown that these chemicals may have wide use in horticulture, simplifying the work of the nurseryman and saving dollars and time. It has been found that leaf removal of hydrangeas by chemical defoliants prior to storage prevents leaf rot which often involves the terminal buds containing the flowers to be forced into growth the next season.

The potential use of chemical defoliants in the agricultural industry has not yet been fully realized. They are presently in use in the growing of cotton to facilitate harvesting, and commercially, to a limited extent, for harvesting of seed beans. Besides being used in the culture of hydrangeas, this defoliant may be of value in the culture of roses and other deciduous nursery stock.

RICE EXTRACTS FOR THE PREVENTION OF VIRUS INFECTIONS IN PLANTS

A possible means of preventing virus infections in plants may be the use of extracts from rice plants. Two Chemical Corps scientists have conducted experiments by inoculating pinto bean plants with tobacco mosaic virus and dipping some of the plants into solutions containing rice extracts. In most cases, the treated plants grew and remained healthy while the untreated plants died or were severely damaged.

Several different parts of several rice varieties were used, notably rice "juice" from crushed leaves, and rice polish, the by-product remaining after rice kernels are milled. Rice polish, in general, proved the most effective of all the extracts. It did not appear to matter whether the polish was applied before or immediately after the virus. The preliminary experiments have been with greenhouse plants prior to being tried in the field.

In addition to experimenting with tobacco mosaic virus and pinto bean plants, trials were made with common bean mosaic virus, tobacco necrosis virus, and southern bean mosaic virus on pinto plants; pod mottle virus on pinto bean plants; and tobacco mosaic virus on tobacco plants.

Results were uniformly good and in several cases 100-percent inhibition of disease was noted. Several significant implications can be attached to this discovery:

1. Rice polish, in effect, amounts to an "immunizing" or chemotherapeutic substance for the prevention of several types of virus diseases of beans under greenhouse conditions. In this sense, it is, perhaps, analogous to some drugs which prevent diseases in human beings and animals.
2. A more rapid approach to control of plant virus may be gained by "immunization" rather than by developing resistant strains.
3. Since rice polish is effective against plant virus disease, it might also be effective against virus diseases of humans and animals.

DEW METER

A dew meter for recording the period during which plants are wet with dew has been developed by the Biological Laboratories of the Chemical Corps. This consists of a clock mechanism with a rotating disk mounted in a horizontal plane. An indelible pencil is mounted above the disk. When dew is deposited on the plate the moisture dissolves the pigment from the pencil and leaves a mark on the disk. By calibrating the disk, it is possible to determine when dew first formed, when it dried up, and how long it lasted.

This is an extremely valuable instrument in the field of plant pathology since infection and spread of plant diseases are closely associated with dew or free moisture on plant leaves.

MECHANICAL SMOKE GENERATORS

Experience has shown that mechanical smoke generators, originally developed by the Chemical Corps and used very effectively for screening combat areas, can also be used for disseminating agricultural chemicals. These "smoke ginnies"

have been demonstrated to be very useful in putting out fogs of insecticides, fungicides, and plant growth regulators for the prevention of disease in orchard trees. The efficacy of some sprayed material increases with a decrease in droplet size. The fine particle size obtainable with these smoke generators make them excellent equipment for orchardists.

These generators which proved valuable in saving lives and property in time of war offer many peacetime possibilities. Weighing about 180 pounds, a generator can be handled by two men. Under proper meteorologic conditions it is capable of laying a protective blanket of fog over an area 5 miles long and 200 yards wide.

MOLD ON GRASSES AND STRAW

Certain species of molds grow on straw and dried grasses and produce toxins which are harmful to domestic animals. Chemical Corps scientists isolated several toxic substances from Myrethecium verrucaria. This work was published in the Journal of Biological Chemistry, May 1955. Recently some difficulty has been encountered in Australia from cattle eating dry grass contaminated with molds which produce these toxins. The fact that this work was reported was of great help to Australian authorities in their studies on this particular problem

FLAMETHROWER

The commercial flamethrower, now in use in agriculture, is a direct outgrowth of the flamethrower developed by the Chemical Corps. It is used to burn out weeds growing between rows of young cane and cotton. It has also been used effectively in removing hard packed ice and snow from airfield runways.

Water hyacinths that clogged the Mississippi Delta below New Orleans responded when the flamethrower containing a special mixture of half gasoline and one-quarter each of fuel oil and kerosene was used.

A modification of the flamethrower known as the flame cultivator is on the market. It was originally designed for weeding cotton, since the base of the woody cotton plant is able to withstand for a short time the high flame. It has been found equally effective in keeping beet and onion fields free of weeds.

RINDERPEST CATTLE VACCINE

Intensive study by the Chemical Corps in cooperation with U.S. Department of Agriculture veterinary officers and Canadian and British scientists, has yielded a rapid method of producing quantities of protective vaccine against rinderpest or cattle plague. Rinderpest is a fatal and highly transmissible virus disease. The investigation resulted in an improved process by which large quantities of vaccine could be produced much more quickly and inexpensively.

PEACETIME USE OF CHLOROPICRIN

Nematodes, soil-borne fungi, and bacteria, and more recently weeds have been found to respond to the war gas chloropicrin in greenhouses and in field work. It has also been used as a fumigant in mills, warehouses, and ships where insects and rodents are a nuisance, and as a fumigant for insects infesting granaries, cereal bins, and other grain storage facilities.

Many reports on chloropicrin indicate a material increase in yield of crops following partial soil sterilization with this material. Not only are weed seeds killed by the chemical but nematodes and other insects as well as harmful fungi and bacteria are destroyed. Root rots are reduced in virulence and damping off fungi are eliminated by the treatment. As a result of these various effects, yields of pineapples, tomatoes, eggplant, peppers, carrots, and many other vegetable and flower crops have been increased.

Soil sterilization by chloropicrin is temporary and with the loss of vapors, crops can again be grown in the soil. For greenhouse work, treatment with chloropicrin replaces steam sterilization and has the advantage of not altering the physical condition of the soil.

Insecticides and Rodenticides

ANTICHOLINESTERASE INSECTICIDES

Studies on nerve gases and the release to the public of this information have led to the manufacture and marketing of new and more effective insecticides. Some of these are parathion, TEPP (tetraethyl pyrophosphate), and HETP (hexaethyl

tetraphosphate). The development of insecticides was aided by Chemical Corps studies of how anticholinesterase compounds work. Important civilian use is the treatment of those who are accidentally poisoned by anticholinesterase insecticides. These civilians included workers in plants that produce the insecticides, loaders and pilots of planes that disseminate them in the form of crop dusting powders, and others who are accidentally poisoned by organophosphorus insecticides.

DDT

Successful development and experimental work on DDT was coordinated and shared by a number of agencies. Notable among these were the Insect and Rodent Control Committee (now under the National Research Council), the Department of Agriculture's Bureau of Entomology and the Army Chemical Corps. Experiments were performed involving the injection and exposure of insects under varied environmental conditions. The physiological significance of various solvents for DDT was also studied. It has been suggested that the DDT molecule may act upon nervous structures by a rapid physicochemical adsorption at the surface of the nerves. This results in disorganization and derangement of normal nerve functions. An improved method of producing technical grade DDT was developed by Chemical Corps personnel and the findings published in 1946. This method of production is based on the reaction of chlorosulfonic acid with chloral hydrate and chlorobenzene. This process makes possible the use of a minimum amount of acid in the condensation process and affords a source of gaseous hydrogen chloride which can be used for other purposes. These and other advantages make the process of value for the smaller manufacturer.

Military need for the project originated when the Armed Forces required DDT in quantity to combat disease-carrying insects such as malaria-transmitting lice

RODENTICIDES

The discovery of rodenticide 1080 (sodium fluoroacetate) is one of the outstanding examples of the effectiveness of cooperation in research activities. The importance of this work was dramatically emphasized when our Armed Forces operating in the South Pacific encountered ratborne diseases. The Office of Scientific Research and Development provided additional funds, and a close cooperation was set up among various research groups, including the Medical Division of the Chemical Warfare Service (now part of the U.S. Army Chemical Warfare Laboratories of the Army Chemical Corps).

From this coordinated activity, sodium fluoroacetate was developed and its pharmacology studied. It became one of the most potent rodenticides available. By interfering with acetate utilization in the carbohydrate matabolism of susceptible species, 1080 produces severe disturbances in the central nervous system and the heart. The rodenticide is so toxic to dogs that 50 micrograms per kilogram will cause death. Rats are only slightly less susceptible. This compound is useful for control of prairie dogs and many species of ground squirrels, and will satisfactorily control mice. These rodent pests are destructive for crops, stored food, and other material as well as being reservoirs of infectious diseases.

Sodium fluoroacetate's very high toxicity, however, poses an important question of control. The compound is obviously too toxic for general distribution; therefore it must be employed only by the most expert and careful specialist.

Insect Repellants and Attractants

There has long existed in the minds of insect physiologists the conviction that some correlation must exist between the structure and properties of chemical compounds and their activity as insect attractants and repellants. The experimental data available offer little support to this hypothesis as far as sense of smell is concerned, but information accumulating on the taste responses leads to some hope that definite relations can be mapped out eventually.

Inspect responses to certain odors have long been known and made use of. For example, carbon dioxide is used as an attractant for mosquitoes; essential oils, specifically geraniol and eugenol, for Japanese bettles; and various fermentation products for different species of flies. No one has yet been able to deduce what chemical factors are effective in stimulating olfactory receptors, beyond theorizing that effective compounds must possess first the ability to penetrate the cuticle and second, must then have ability to react with something in the nerve ending. These requirements probably impose both water and oil solubility upon the molecule involved.

Investigations in taste responses and structures have brought out many of the factors involved in attraction and repellency. Experiments with inorganic compounds have shown a definite order in the stimulating efficiency of actions. A similar order also proves to be true ionic mobility for these ions. Anions also fall into a certain order, with OH as the most effective.

A number of aliphatic organic compounds have been examined and their stimulating power has been correlated with such properties as boiling point, molecular area, oil-water distribution coefficients, molecular moments, vapor pressures, and activity coefficients. For such series of homologous compounds as alcohols, ketones, and aldehydes, the stimulating power increases logarithmically as the length of the chain increases.

It can be seen that some order is being produced from a situation once as chaotic as that ruling olfaction. We now have a basis on which to build a real knowledge of the factors affecting repellency, and in time should be able to produce structurally designed repellants.

Antifouling Devices

SHIPBOTTOM PAINTS

Marine organisms which attach themselves to the hulls of ships can materially reduce the speed and increase the fuel consumption of ships. It also reduces the ship's working time by the amount of time spent in drydock. Barnacles are the principal marine organism attaching themselves to the ship's bottom. Although the volume of growth depends mainly on the latitude and the season, they may accumulate to such an extent that a layer may project several inches from the ship's hull. As these growths live only in salt water, it is possible to kill them by docking the vessel in fresh water, but the shells still adhere, and thus they furnish resting places for fresh growths.

The Chemical Corps helped to solve this problem by producing a toxic paint which destroys the organism. Such a paint must meet several requirements. First, it must be permanent and must retain its poisonous properties during its own life. The poison must be sufficiently powerful to kill or prevent the attachment of the marine organisms, although the poison need act only during the period of attachment since the organism begins life as free swimmers, then attach themselves and obtain food from the surrounding water.

Another paint was developed to be used under the antifouling paint to protect the steel plating of the ship from the corrosive action of the sea water and to prevent damage from the toxic paint. Moreover it was desirable that these paints consist of domestic materials to keep the cost of manufacture and application as low as possible.

Two different toxic paints were developed, a varnish type applied cold and drying by evaporation, and a hot-plastic paint which is applied in a melted form that solidifies on cooling.

The hot plastic paints are more expensive to apply as they form a heavier coat; however they are much more durable and are advised for use on long cruises. This type of paint was tested on the bottoms of several destroyers and gave excellent protection to exposure and marine growths.

The varnish type paint consists of a vehicle, (in this case, resin modified by coaltar), a pigment to give body and color, a volatile solvent to act as a thinner, and the poison. The oxides of mercury were found to be the most effective poisons.

Many materials were tested experimentally in the effort to find the proper relation between the poison and the vehicle. If the paint film is too impervious to water, the poison cannot act; on the other hand, if it holds the poison too loosely, the poison will dissolve leaving the paint unprotected.

MARINE PILING COATINGS

At the request of the National Research Council, in 1923, the Chemical Corps sought a poison for marine borers that destroy docks and other waterfront structures. The annual loss due to these borers is estimated at over $1 million.

The studies were conducted at Beaufort, N.C., where all the principal types of marine borers could be found. The Chemical Corps was greatly aided in the research by the Quartermaster Corps, U.S. Army; the Navy Department; and the Department of Commerce, which supplied funds and laboratory facilities.

The poisonous compounds were made and investigated at Edgewood Arsenal, Md. More than 100 compounds in all were studied. It was found that the

organic compounds of mercury, arsenic, and copper were the most efficient. Most effective of all were the arsenical compounds used in chemical warfare, or derivatives of those compounds. Lewisite (made by passing acetylene through arsenic trichloride in the presence of aluminum trichloride as catalyst) gave a derivative which proved to have the highest specific toxicity against marine borers.

The poisonous compounds were mixed with either fuel oil or creosote, and in this mixture were saturated test pieces of pine and oak, 1 foot long and 3 inches square. Each compound was soaked into three test pieces and they were installed in sets of three. Each test piece was sheathed on two sides by untreated half-inch pine boards. The embryo marine borer was thus enabled to gain entrance in the untreated wood, and by the time the chemically treated portion was reached, the shipworm was fully grown and less susceptible to the action of the poison. In 3 months the untreated pieces were completely riddled. The test pieces which stopped the borer, however, were the ones soaked in creosote solutions of five compounds: mercury benzoate, copper ortho-nitrobenzoate, mercury resinate, mercury stearate and diphenylaminechloroarsine (a poison smoke material).

Straight creosote, usually used on waterfront structures, will not stop the borers, and 15 chemical compounds are known at present which furnish from 25 to 50 times greater protection than creosote. The protection offered by creosote alone may be increased very materially, at slight cost, by the addition of one of the poisonous compounds mentioned above. Fuel oil plus a specific poison will give better protection than creosote at a lower initial cost. The use of these poisons will not involve any change in the present commercial methods of treating piling, and there is little or no increased hazard in the installation of piling.

Buildings and Equipment

THE RECORDING ELLIPSOMETER

The Army Chemical Corps, in its effort to determine how much or how long a chemical agent will remain on the surface of the human skin, clothing, in the respiratory tract, or in the soil has developed an instrument that will record this. Known as the recording ellipsometer, a patent for it has been granted to Dr. H. J Trurnit, Medical Laboratories, Army Chemical Center, Md. It is based on an optical method which permits accurate measurement of the thickness of adsorbed layers on solids to a two-millionth of an inch. Two hundred millions of such layers would be only 1 inch thick; thus, a single layer of small molecules can be readily detected.

The principle underlying this measuring device was actually developed by Paul Drude, a European physicist, during the end of the last century and refined by later workers in this country and in Europe. Dr. Trurnit's contribution, which opens a new field of research and for which the patent has been granted, is a combination of this method with a photoelectric recording system. This makes it possible not only to measure these molecular surface layers but to follow their changes during a surface reaction under many conditions, whether the solid is in a vacuum, at normal atmospheric pressure, or submerged in a liquid. This type of equipment is especially useful in studies of biological enzyme systems.

LABORATORY SAFETY EQUIPMENT

The Chemical Corps, in an effort to insure adequate safety measures for the protection of its personnel engaged in the study of biological warfare, has developed processes, equipment, and building designs, some of which are described below, that have created new items for manufacture for the civilian market and have contributed immeasurably to health and safety. The utilization of these devices and processes may be found in the manufacture and supply of protective clothing, laboratory supplies and equipment. The improved techniques in research are used by numerous Government agencies, commercial companies, by pharmaceutical manufacturers in the preparation and supply of pharmaceuticals and hospital supplies and equipment, by hospitals and clinics, in commercial research establishments and in the chemical industry

VENTILATED SAFETY CABINETS

These cabinets protect personnel by physical separation from hazardous operations. The cabinets are usually constructed of stainless steel. They incorporate ultraviolet radiation and a blower system which is equipped with a filter unit so

that exhaust air is bacteriologically clean. Operations are viewed through a glass vision panel and there is a continuous flow of air away from the operator. Service connections are provided for electricity, air, gas, vacuum, hot and cold water and drain. Optional equipment available consists of entrance air locks, pipetting devices and steam formaldehyde sterilizers. Cabinets are available in freon-tight or nonairtight units. Variations of this cabinet are available that may be flanged and bolted together forming a completely closed system for highly hazardous operations.

VENTILATED PERSONNEL HOODS

These hoods are designed to protect the respiratory tract of individuals working with radioactive materials, chemical fumes, acids and bacterial aerosols. This lightweight hood is fabricated of plastic with a large distortion-free window of heavy gage transparent plastic that does not fog up from moisture. A drawstring at the neck permits adjustment for fit and for exhausting air. Sealed-in plastic tubing enables connection to a supply of clean compressed air. The lack of headpiece or frame for support of the hood contributes to the comfort and convenience of the wearer.

VENTILATED PERSONNEL SUITS FOR LABORATORY USE

This suit is designed for the protection of the entire body of the wearer from radioactive particles, chemical fumes, dangerous gases, and bacterial aerosols. It is so constructed as to enable long working periods in dense clouds of airborne particles. Featured is a well designed air conditioning system. Fogging is eliminated by the thorough dispersion and exhaust of air throughout the suit. This extremely lightweight suit provides the wearer good mobility and visability in any direction.

ARM LENGTH NEOPRENE GLOVES

These gloves are designed to be attached to the ventilated safety cabinets. They protect the operator's hands and arms within the cabinet while working with hazardous materials. Both straight gloves and accordion sleeve type are available. Each is useful for certain types of work in the cabinet. The gloves are designed to withstand autoclaving and exposure to chemical solutions and radiations.

PORTABLE SAFETY CABINETS (COLLAPSIBLE)

This low cost collapsible cabinet allows investigators with limited funds to have safety equipment that has many of the features of the more expensive cabinets. Its portability also makes it ideal for fieldwork. It is constructed of sheet plastic attached to a rigid tubing frame with optically clear windows and glove ports for quick cuff attachment. This completely collapsible airtight unit makes an acceptable cabinet in which work with toxic materials may be done without hazard to personnel.

AIR FILTER

This filter is designed to remove infectious aerosols from the exhaust air of the ventilated safety cabinets. The air is filtered at the rate of 300 cubic feet per minute through a filtering surface of 15 square feet composed of two layers of spun glass fibers whose diameter is 1.25 microns. The filtration efficiency for bacterial aerosols is greater than 99 percent. Before changing the filter media, the air filter is sterilized with formaldehyde and steam.

MICROINCINERATOR

This item was designed to eliminate the hazard connected with sterilizing loops and needles used in connection with infectious materials that might splatter on contact with an open flame. It consists of a laboratory gas burner modified by adding a side tube to form a chamber for sterilizing contaminated wire loops and needles.

SAFETY CENTRIFUGE TRUNNION CUPS

In case a leak or fracture has occurred in the centrifuge bottles or tubes due to high centrifugal forces, this new type sealed cup will contain the aerosol of infectious material within the cup. The standard type centrifuge trunnion cups are threaded to take a dome cover fitted with an O-ring seal. This new sealed cup prevents the aerosol from being distributed to the open room by the draft created by the fanning action of the rotating head. The operator may safely open and

decontaminate the container within the confines of a safety cabinet or hood. These safety centrifuge cups were designed at Fort Detrick from the original idea of workers at the Navy Biological Laboratories at Oakland, Calif.

LEAKPROOF MIXING BOWL OR BLENDER

The grinding of infectious tissues sometimes produces harmful aerosols in certain laboratory operations. The leakproof mixing bowl was developed to eliminate this. The bowl has teflon bearings and is equipped with a siphon and a drain valve which allows for the removal of fluid in a closed system. Leakage at the bottom bearing is prevented by (1) use of teflon washers between the cutting blade assembly which allows the exterior locking nut to be tightened so that any possible loosening of the assembly by vibration is eliminated. Leakage at the top is prevented by utilizing a solid aluminum plate which is tightened by means of wingnuts over a rubber O-ring gasket seated in the top of the bowl. A water-jacketed bowl is available for those operations requiring the maintenance of a constant temperature.

STERILE NEEDLE HOLDER

This is an airtight chamber for dispensing sterile hypodermic needles. The container is so constructed that when closed it is completely airtight and capable of dispensing one needle at a time without contaminating the remainder. The container is loaded with clean needles and closed, then the container is steam autoclaved until sterile. The needles will remain sterile indefinitely.

TOXIC PLANT OPERATIONS

In the operation of toxic plants, the Chemical Corps has contributed much knowledge and know-how to the chemical industry for the protection of personnel working with highly toxic compounds. Protective clothing and masks have been designed for use when maintenance work is necessary in contaminated areas Devices for detection of minute amounts of contaminants in the plant atmosphere or in areas surrounding the plant have been put into use.

Much work has been done on the design and operation of chemical plants in which all process equipment is located in sealed cubicles with all operations controlled from a remote area. In this way, no operators are ever in the immediate area of the equipment, and even manual operations are performed by extensions through a sealed wall. Existing standard equipment has been modified to make it acceptable for use in highly toxic areas. Methods of decontamination of equipment or material for salvage have also been developed.

A method of decontaminating the exhaust from ventilation systems of toxic plants and for determining the minimum ventilation or air changes required in toxic areas has reduced the hazards of work with such chemicals. This safety equipment along with safety standards and rules for toxic areas is of great value to chemical industries.

Plants and Processes

CONVERSION OF HYDROCHLORIC ACID TO CHLORINE

Waste disposal has become a problem of major importance to industry in recent years as local governments have placed increasing emphasis on pollution control. The Chemical Corps shares this problem and has been pioneering in developing techniques to convert waste hydrochloric acid to chlorine. A method proved satisfactory by the Chemical Corps involves the treatment of the waste hydrochloric acid with sodium hydroxide, producing a sodium chloride solution. This solution is then purified and conducted into Hooker-type S cells where it is converted to useful chlorine and a cell liquor rich in sodium hydroxide. The cell liquor is then recycled and used to neutralize more waste hydrochloric acid. This system not only eliminates the waste disposal problem, it also allows the economic recovery of reusable chlorine. Other methods utilizing other types of cells are also being investigated.

DE NORA CELL CHLORINE PROCESS

During the design of a plant between 1950 and 1952 for the production of an intermediate used in the nerve gas program, it was determined that a chlorine plant was necessary to allow for the use and recycle of chlorine and caustic. A study of the various chlorine cells indicated that the DeNora cell process held the greatest promise for this particular application. Until that time this process

had never been utilized in this country nor, in fact, in any country on the scale which was contemplated for this particular plant. This process has the distinct advantage of producing directly a very pure and highly concentrated sodium hydroxide. It is of the type desired in the rayon industry and can be produced most economically by this process.

This process uses mercury as one of the electrodes. The mercury amalgamates directly with sodium which can then be hydrolized producing sodium hydroxide in an extremely concentrated form. This method eliminates the need for caustic evaporators or any other method previously required in the production of concentrated caustic.

PHOSPHORUS OXYCHLORIDE REDUCTION

In the production of nerve gases the Chemical Corps was faced with the problem of disposal of large quantities of byproduct phosphorus oxychloride. The amount of this material involved was so large that it could not be disposed of to industrial users; so it became necessary to develop a method of conversion to some other product that could be reused in the nerve gas process.

A process was developed to convert this phosphorus oxychloride to phosphorus trichloride which can be reused. This process utilizes a large charcoal-filled furnace through which phosphorus oxychloride vapors pass and react with the carbon to form carbon monoxide and phosphorus trichloride. The charcoal bed is heated by the passage of electrical current through it; in this respect it is a conventional electric resistance furnace, although this process for oxychloride reduction is the only one in existence today.

The chemistry of this process is very simple, but the operating problems were many and required a great deal of development work in the production plant. The two greatest or most difficult problems encountered were:

(*a*) Corrosion of phosphorus oxychloride at 1,700° to 2,000° F. It has been necessary to remove all metal parts from direct contact with the hot vapors in the furnace. Also, a special ceramic is required for furnace lining since ordinary furnace brick has a life of only a few days in this atmosphere.

(*b*) Solids formation as side reactions in the oxychloride reduction. This solids formation has been a great source of trouble by plugging recovery equipment and deactivating the charcoal bed. This problem has been partially solved by chlorination of furnace product and partially by reduction or elimination of volatiles and bound hydrogen from the carbon used in the furnace.

These furnaces can operate, at the present time, at approximately 200 percent of design capacity.

Packaging and Container Devices

REINFORCED PLASTICS

The advent of reinforced plastics provided new materials for use in packaging. The Chemical Corps used polyester resin to develop bleach containers, and in fabricating a storage tank for the Chemical Corps decontamination truck. This reinforced plastic drum was tested by the Chemical Corps and by several manufacturers and found satisfactory.

POLYETHYLENE CARBOYS

A polyethylene carboy has been developed by the Chemical Corps to replace glass carboys formerly used. Glass ones were breakable to the extent of 20 percent of the carboys formerly used by military establishments.

MULTIWALL SACKS

Rough handling tests of recently developed multiwall sacks were conducted to determine the suitability of these packages for use as oversea shipping containers for calcium chloride. The most satisfactory of those tested was a three-ply sack that proved to be clearly superior to the sacks currently specified for this purpose.

OVERPACKS FOR POLYETHYLENE DRUMS

In an effort to devise a suitable substitute for glass carboys, the Chemical Corps evaluated various overpacks for the polyethylene drums that had been recommended by industry. The result of this evaluation showed that steel overpacks were more suitable for this purpose than plywood or wirebound overpacks and that polyethylene drums were satisfactory replacements for carboys.

AEROSOLS

The aerosol industry owes much of its initial design and development to research carried out during World War II in the production of aerosol insecticides for the Armed Forces. The insecticide aerosol made it possible for our Armed Forces to campaign and live in insect-infested areas. Spray dispensers which were first used to spread insecticides in jungle areas have developed into a major U.S. business. About 185 million units were filled by 1955 by 105 firms for a $190 million business. More than 300 products, from shaving lather to paint remover, are now packaged in spray containers under 500 brands. While the insecticide aerosol still heads the list, room deodorants, hair sprays, shave creams, and other production items are growing by leaps and bounds.

Materials

SOLDER SUBSTITUTES

In order to find replacements for critical materials in the event of an emergency, a search was instituted for an adhesive for metal bonding. A resinous adhesive of the epoxy type was discovered that formed an exceptionally tough bond. In the cured state this bond is not affected by the action of ordinary chemical solvents. Pigments may be incorporated easily in this adhesive. In the use of the adhesive, the cost of joining metal to metal was reduced 50 percent.

Miscellaneous

FOOD IRRADIATION

Research has shown that gamma irradiation of foods and food products improves the storage qualities of many foods without introducing health hazards. Chemical Corps personnel at Dugway Proving Ground in cooperation with the Quartermaster Corps have been irradiating foods since 1954 in an effort to provide a sound and tasty menu for the pentomic GI.

FORMATION, CLASSIFICATION, AND SIZE MEASUREMENT OF SMALL PARTICLES

The Chemical Corps, in the interest of developing scientific data on the preparation, classification, control, and measurement of small particles for use in the field of biological warfare, contracted with General Mills, Inc., to conduct experiments along this line. As a result a comparatively new line of work known as fine particle technology has emerged. General Mills, through its work on the contract, has done considerable work outside the biological warfare field using the information and know-how developed through the contract work to improve methods of handling plastic materials and ingredients for protective coatings, to improve food processing systems, and possibly innovations in mineral processing techniques.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 816

PERSONAL EXEMPTION FOR CHILDREN PLACED FOR ADOPTION

AUGUST 10, 1959.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. MILLS, from the Committee on Ways and Means, submitted the following

REPORT

[To accompany H.R. 47]

The Committee on Ways and Means, to whom was referred the bill (H.R. 47) to amend the Internal Revenue Code of 1954 to provide a personal exemption for children placed for adoption, having considered the same, report favorably thereon with an amendment and recommend that the bill as amended do pass.

The amendment is as follows:

On the first page, line 13, strike out "1957" and insert in lieu thereof "1958".

I. SUMMARY OF BILL

For 1959 and subsequent years this bill would amend the definition of a dependent for purposes of claiming a $600 dependency exemption to treat in the same manner as a natural-born child of an individual not only a legally adopted child, as is provided by present law, but also a child placed with him by an authorized placement agency for legal adoption by him if the child is a member of the individual's household. An exemption could already be claimed for such a child under present law (assuming other required tests are met) but generally only after he has been in the home of the taxpayer for an entire year. The effect of the bill is to waive this "entire year" requirement where the child is placed in the home by an authorized placement agency.

This bill, as amended, has been approved by the Treasury Department and has been reported unanimously by your committee.

II. GENERAL STATEMENT

The general definition of a dependent under present law provides that a child of the taxpayer (as well as certain other specified relatives) qualifies if the taxpayer provides more than half of the child's support

for the calendar year. (In addition such a dependent, unless under 19 or attending school, must have a gross income of less than $600 for an exemption to be claimed.) In determining whether an individual is a "child" (or other relative of the taxpayer) a legally adopted child of an individual is treated as his natural child. As a result of these rules, a full exemption may be claimed for a child which is either born to, or adopted by, the taxpayer during the year.

Present law also makes provision for the claiming of an exemption for persons who do not bear any of the specified relationships to the taxpayer, if the individual "for the taxable year of the taxpayer" has as his principal place of abode the home of the taxpayer and he is a member of the taxpayer's household. (Here also the support test must be met and the dependent's earnings must be under $600.) As is indicated by the committee reports on the Internal Revenue Code of 1954, when this provision was added, this was intended to make it possible to claim exemptions for "foster children or children in the home awaiting adoption." This requirement that the individual "for the taxable year" have the home of the taxpayer as his principal place of abode generally has meant that taxpayers may not obtain an exemption in the first year for children taken into their home for adoption. On the other hand, an exemption may be claimed in the first year for children which are legally adopted in that year.

Your committee believes that this discrimination in the first year against children awaiting adoption, relative to adopted children, is undesirable. In addition to this, however, there are other elements of discrimination under the present provision. For example, the present regulations provide that where a taxpayer takes a newborn child into his home for adoption directly from the hospital, a dependency exemption may be claimed. However, if the adoption agencies require that for a specified period of time the child remain in a nursing or boarding home before going to the private home to await adoption, no dependency exemption may be obtained in this first year in the private home.

Probably a more important form of discrimination arises, however, from variations in State laws as to what constitutes "adoption." In some States an interlocutory or intermediate decree gives the petitioner custody and all of the rights of a final decree during a statutory waiting period. In such cases "legal adoption" occurs at the time of the entering of the interlocutory decree of adoption and an exemption can be claimed in this year even though the child did not live in the taxpayer's home for the entire year. In other States, however, there is no interlocutory decree during the waiting period. As a result in these States there is no "legal adoption" until after the waiting period and, therefore, no exemption may be claimed with respect to this period unless it happens to coincide with the calendar year.

To remove the discriminations against taxpayers with children in their homes awaiting adoption this bill (by amendment of sec. 152(b)(2)) provides that not only are legally adopted children to be treated in the same manner as natural-born children of any individual but also a child who is a member of the individual's household. However, this child is to be so treated only if the child is placed with the individual by an authorized placement agency for legal adoption by him. Thus, it will be possible to claim a dependency exemption for

a child who so qualifies even though he did not live in the taxpayer's home for the entire year. The requirement that this treatment be available only where the child is placed in the individual's home by an authorized placement agency is provided so that the Internal Revenue Service will have a means of distinguishing between cases where the child is placed in a home for adotion from those cases where the custody of the child is temporary and the individual has no intention of adopting the child. It is believed that this limitation will prevent abuse of the provision.

This bill as amended by your committee will be effective for taxable years beginning after December 31, 1958.

This bill as amended has been approved by the Treasury Department and has been reported unanimously by your committee. It is expected to have only a negligible effect on revenues.

III. CHANGES IN EXISTING LAW

In compliance with clause 3 of rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill, as introduced, are shown as follows (new matter is printed in italic, existing law in which no change is proposed is shown in roman):

INTERNAL REVENUE CODE OF 1954

SEC. 152. DEPENDENT DEFINED.

(a) **General Definition.**—For purposes of this subtitle, the term "dependent" means any of the following individuals over half of whose support, for the calendar year in which the taxable year of the taxpayer begins, was received from the taxpayer (or is treated under subsection (c) as received from the taxpayer):

(1) A son or daughter of the taxpayer, or a descendant of either,

(2) A stepson or stepdaughter of the taxpayer,

(3) A brother, sister, stepbrother, or stepsister of the taxpayer,

(4) The father or mother of the taxpayer, or an ancestor of either,

(5) A stepfather or stepmother of the taxpayer,

(6) A son or daughter of a brother or sister of the taxpayer,

(7) A brother or sister of the father or mother of the taxpayer,

(8) A son-in-law, daughter-in-law, father-in-law, mother-in-law, brother-in-law, or sister-in-law of the taxpayer,

(9) An individual (other than an individual who at any time during the taxable year was the spouse, determined without regard to section 153, of the taxpayer) who, for the taxable year of the taxpayer, has as his principal place of abode the home of the taxpayer and is a member of the taxpayer's household, or

(10) An individual who—

(A) is a descendant of a brother or sister of the father or mother of the taxpayer,

(B) for the taxable year of the taxpayer receives institutional care required by reason of a physical or mental disability, and

(C) before receiving such institutional care, was a member of the same household as the taxpayer.

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(b) Rules Relating to General Definition.—For purposes of this section—

(1) The terms "brother" and "sister" include a brother or sister by the halfblood.

(2) In determining whether any of the relationships specified in subsection (a) or paragraph (1) of this subsection exists, a legally adopted child of an individual (*and a child who is a member of an individual's household, if placed with such individual by an authorized placement agency for legal adoption by such individual*) shall be treated as a child of such individual by blood.

(3) The term "dependent" does not include any individual who is not a citizen of the United States unless such individual is a resident of the United States, of a country contiguous to the United States, or the Canal Zone, of of the Republic of Panama. The preceding sentence shall not exclude from the definition of "dependent" any child of the taxpayer—

(A) born to him, or legally adopted by him, in the Philippine Islands before January 1, 1956, if the child is a resident of the Republic of the Philippines, and if the taxpayer was a member of the Armed Forces of the United States at the time the child was born to him or legally adopted by him, or

(B) legally adopted by him, if, for the taxable year of the taxpayer, the child has as his principal place of abode the home of the taxpayer and is a member of the taxpayer's household, and if the taxpayer is a citizen of the United States.

(4) A payment to a wife which is includible in the gross income of the wife under section 71 or 682 shall not be treated as a payment by her husband for the support of any dependent.

(5) An individual is not a member of the taxpayer's household if at any time during the taxable year of the taxpayer the relationship between such individual and the taxpayer is in violation of local law.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 817

REDUCTION OF CABARET TAX FROM 20 PERCENT TO 10 PERCENT

AUGUST 10, 1959.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. FORAND, from the Committee on Ways and Means, submitted the following

REPORT

[To accompany H.R. 2164]

The Committee on Ways and Means, to whom was referred the bill (H.R. 2164) to repeal the cabaret tax, having considered the same, report favorably thereon with amendments and recommend that the bill as amended do pass.

The amendments are as follows:

Strike out all after the enacting clause and insert the following:

That paragraph (6) of section 4231 of the Internal Revenue Code of 1954 (relating to imposition of tax with respect to roof gardens, cabarets, and other similar places) is amended by striking out "20 percent" and inserting in lieu thereof "10 percent".

SEC. 2. The amendment made by the first section of this Act shall apply only with respect to periods after 10 antemeridian on the first day of the first month which begins more than 10 days after the date of the enactment of this Act.

Amend the title so as to read:

A bill to reduce the cabaret tax from 20 percent to 10 percent.

I. GENERAL STATEMENT

H.R. 2164 as amended by your committee reduces from 20 percent to 10 percent the tax imposed (by sec. 4231(6)) with respect to roof gardens, cabarets, and similar establishments. This change in rates is to be effective as of 10 a.m. on the first day of the month beginning more than 10 days after the enactment of this bill. This bill has been reported unanimously by your committee.

II. REASONS FOR THE BILL

Your committee is reporting this bill to reduce the cabaret tax for two principal reasons: First, the present 20-percent rate is discriminatory in that the rates of almost all of the other ad valorem excise taxes do not exceed 10 percent; second, the present high rate of this tax is believed to have been a substantial deterrent to the employment of musicians and other entertainers.

The Excise Tax Reduction Act of 1954 as it passed the House established a ceiling rate of 10 percent for ad valorem excise taxes. The report of your committee with respect to that bill stated that the rates above 10 percent were reduced to that level in order to stimulate business and employment and also to provide "a more equitable tax system by leveling down those rates which are now excessively high * * *" and in this manner removing discrimination. However, the 1954 bill as finally enacted departed from this ceiling rate of 10 percent in that the higher rate was continued with respect to the cabaret tax and a few other taxes. In the case of the cabaret tax, the 20-percent rate is particularly onerous because although this tax is classed as an admissions tax its base includes not only the price paid for any admissions but also amounts paid for refreshments, services, and merchandise. Moreover, the 20-percent rate applies only where there is a combination of entertainment and the serving of food or beverages. Where only entertainment is provided the 10-percent admissions tax usually applies; on the other hand, where there is only the serving of food and beverages, generally no tax is imposed. Thus the present 20-percent tax discriminates against the combination of food or beverages and entertainment since either, if provided separately, is taxed at a lesser rate or is not taxed at all.

In addition, this discriminatory, high rate of the cabaret tax has had a serious adverse effect on the employment of musicians and other entertainers.

In recent years the employment of musicians and entertainers as a class has been at a relatively low level as a result of the drastic technological changes which have occurred in the entertainment business. The decline in employment, begun with the passing of the silent movies and vaudeville in the early thirties, has continued as first radio and then television has increased the emphasis on home entertainment. The trend away from "live" entertainment also has been accelerated by the increase in the use of records in the home and places of entertainment.

Moreover, statistics show that the present high rate of the cabaret tax has been an important factor in adding to this decline. For example, a sizable sample of establishments in business in 1954 (when the cabaret tax was 20 percent) who also were in business in 1943 (when the cabaret tax was 5 percent) indicated a decline in the employment of musicians in this period of about 56 percent in terms of man-hours. This was brought about in large part by a reduction of about 40 percent in the time during which entertainment is provided by these establishments, thus increasing the time when only food and beverages are available and no entertainers are employed. In addition, although there was an increase of 102 percent in the consumer expenditures in all eating and drinking places between the years 1943 and 1955, there was a 40-percent decrease in expenditures for meals

and beverages subject to the cabaret tax between the fiscal years 1943 and 1955. Certainly, statistics of this type suggest that the present high rate of this tax is a significant contributing factor to the difficult times presently faced by many entertainers and that this tax rate should be reduced to the 10-percent level generally applicable to ad valorem excise taxes.

It is estimated that this tax reduction will reduce excise tax collections by about $21 million a year. This bill has been reported unanimously by your committee.

III. CHANGES IN EXISTING LAW

In compliance with clause 3 of rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill, as introduced, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new matter is printed in italic, existing law in which no change is proposed is shown in roman):

SECTIONS 4231 AND 4232 OF THE INTERNAL REVENUE CODE OF 1954

SEC. 4231. IMPOSITION OF TAX.

There is hereby imposed:

(1) **General.**—

(A) **Single admission.**—A tax of 1 cent for each 10 cents or major fraction thereof of the amount in excess of $1 paid for admission to any place.

(B) **Season ticket.**—In the case of a season ticket or subscription for admission to any place, a tax of 1 cent for each 10 cents or major fraction thereof of the amount paid for such season ticket or subscription which is in excess of $1 multiplied by the number of admissions provided by such season ticket or subscription , *or*

(C) to a roof garden, cabaret, or other similar place.

(C) **By whom paid.**—The taxes imposed under subparagraphs (A) and (B) shall be paid by the person paying for the admission.

(2) **Certain race tracks.**—In lieu of the tax imposed under paragraph (1), a tax of 1 cent for each 5 cents or major fraction thereof of the amount paid for admission to any place (including admission by season ticket or subscription) if the principal amusement or recreation offered with respect to such admission is horse or dog racing at a race track. The tax imposed under this paragraph shall be paid by the person paying for such admission.

(3) **Permanent use or lease of boxes or seats.**—In the case of persons having the permanent use of boxes or seats in an opera house or any place of amusement or a lease for the use of such box or seat in such opera house or place of amusement (in lieu of the tax imposed under paragraph (1) or (2)), a tax equivalent to 10 percent (20 percent if paragraph (2) would otherwise apply) of the amount for which a similar box or seat is sold for each performance or exhibition at which the box or seat is used or reserved by or for the lessee or holder. The tax imposed under this paragraph shall be paid by the lessee or holder.

(4) **Sales outside of box office in excess of established price.**—Upon tickets or cards of admission to theaters, operas, and other places of amusement, sold at news stands, hotels, and places other than the ticket offices of such theaters, operas, or other places of amusement, at a price in excess of the sum of the established price therefor at such ticket offices plus the amount of any tax imposed under paragraph (1) or (2), a tax equivalent to 10 percent (20 percent if paragraph (2) applies) of the amount of such excess. The tax imposed under this paragraph shall be returned and paid by the person selling such tickets.

(5) **Sales by proprietors in excess of regular price.**—A tax equivalent to 50 percent of the amount for which the proprietors, managers, or employees of any opera house, theater, or other place of amusement sell or dispose of tickets or cards of admission in excess of the regular or established price or charge therefor. The tax imposed under this paragraph shall be returned and paid by the persons selling such tickets.

[(6) **Cabarets.**—A tax equivalent to 20 percent of all amounts paid for admission, refreshment, service, or merchandise, at any roof garden, cabaret, or other similar place furnishing a public performance for profit, by or for any patron or guest who is entitled to be present during any portion of such performance. The tax imposed under this paragraph shall be returned and paid by the person receiving such payments; except that if the person receiving such payments is a concessionaire, the tax imposed under this paragraph shall be paid by such concessionaire and collected from him by the proprietor of the roof garden, cabaret, or other similar place. No tax shall be applicable under paragraph (1) or (2) on account of an amount paid with respect to which tax is imposed under this paragraph.]

This section shall apply with respect to amounts paid within or outside the United States, but only if the place of admission or performance is within the United States. In the case of any payment outside the United States in respect of which tax is imposed under paragraph (1), (2), or (3) of this section, such tax shall be collected by the person who is to furnish the facility or service, and if such person does not collect the tax he shall be liable for the payment of such tax.

SEC. 4232. DEFINITIONS.

(a) **Admission.**—The term "admission" as used in this chapter includes seats and tables, reserved or otherwise, and other similar accommodations, and the charges made therefor.

(b) **Roof Garden, Cabaret or Other Similar Place.**—The term "roof garden, cabaret, or other similar place," as used in this chapter, shall include any room in any hotel, restaurant, hall, or other public place where music and dancing privileges or any other entertainment, except instrumental or mechanical music alone, are afforded the patrons in connection with the serving or selling of food, refreshment, or merchandise. In no case shall such term include any ballroom, dance hall, or other similar place where the serving or selling of food, refreshment, or merchandise is merely incidental, unless such place would be considered, without the application of the preceding sentence, as a "roof garden, cabaret, or other similar place." Such term does not include any place if—

(1) no beverage subject to tax under chapter 51 (distilled spirits, wines, and beer), is served or permitted to be consumed;

(2) only light refreshment is served;

(3) where space is provided for dancing, no charge is made for dancing; and

(4) where music is provided or permitted, such music is (A) instrumental or other music which is supplied without any charge to the owner, lessee, or operator of such place (or to any concessionnaire), or (B) mechanical music.

[(c) **Performance for Profit.**—A performance shall be regarded as being furnished for profit for purposes of section 4231(6) even though the charge made for admission, refreshment, service, or merchandise is not increased by reason of the furnishing of such performance.]

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 818

MARITAL DEDUCTION FOR CERTAIN SUPPORT ALLOWANCES

AUGUST 10, 1959.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. O'BRIEN of Illinois, from the Committee on Ways and Means, submitted the following

REPORT

[To accompany H.R. 2573]

The Committee on Ways and Means, to whom was referred the bill (H.R. 2573) to amend the Internal Revenue Code of 1954 with respect to the application of the estate tax marital deduction to widow's allowance or award, having considered the same, report favorably thereon with amendments and recommend that the bill as amended do pass.

The amendments are as follows:

Page 2, line 6, strike out "spouse or to the estate of such spouse." and insert in lieu thereof the following:

> spouse, or to the estate of such spouse, within 15 months after the date of the decedent's death.

Page 2, strike out lines 19 and 20, and insert:

> The amendments made by the first two sections of this Act shall apply only with respect to the estates of decedents dying after December 31, 1958.

I. SUMMARY OF THE BILL

H.R. 2573 as amended by your committee provides that the marital deduction is to be available for estate tax purposes with respect to allowances or awards which, pursuant to local law, are paid within 15 months from the date of a decedent's death to the decedent's surviving spouse for her support during the period the decedent's estate is being settled. This is accomplished by specifically providing that these allowances or awards are property "passing" from the decedent to a person, and not "terminable interests" for which no

marital deduction is available. This change is to apply to estates of decedents dying after December 31, 1958.

The Treasury Department has advised your committee that it is not opposed to the bill as amended and your committee was unanimous in ordering it reported.

II. GENERAL STATEMENT

Present law allows a "marital deduction" for property passing to a surviving spouse to the extent of 50 percent of the adjusted gross estate. It is not clear, however, under what circumstances the marital deduction is available with respect to an award or allowance made pursuant to local law for support of a decedent's surviving spouse during the period of the settlement of the decedent's estate. First, there is the question of whether an allowance of this type constitutes an interest in property "passing from the decedent" to the surviving spouse. Second, there is the question of whether such an allowance represents a "terminable interest" in property for which the marital deduction is not allowed. Since these questions for the most part have been resolved by reference to the governing local law as interpreted by the local courts, allowance of the marital deduction for Federal estate tax purposes has varied not only with differences among the laws of the various States, but also with differences in the application of these laws to the various circumstances under which the awards are payable. As a consequence, the allowance of the marital deduction for these awards has varied from State to State. Moreover, there also is uncertainty as to whether any estate tax deduction is available for these allowances.

Your committee believes that the extent to which the marital deduction is allowed with respect to these awards or allowances should be the same in all States during the usual period of the settlement of the estate, and should not turn on the technical questions of whether they are treated by local law as having "passed" from the decedent or as being "terminable interests." Accordingly, in order to clarify the circumstances under which the marital deduction is to be available with respect to such awards, your committee's bill provides (by adding a new paragraph in section 2056(b)) that allowances or awards paid to a decedent's surviving spouse for her support during settlement of the decedent's estate are not to be considered "terminable interests" to the extent that they are paid within 15 months after the date of the decedent's death. It also makes it clear (by adding a new paragraph to section 2056(e)) that allowances or awards, pursuant to local law, for a person's support during the period of settlement of the decedent's estate are to be considered as "passing" from the decedent. The 15-month period is the period after the decedent's death in which the estate tax return is required to be filed, and it is understood that the bulk of these awards are paid within this period. The bill does not affect the application of the "terminable interest" rule to such awards or allowances to the extent they are paid more than 15 months after the date of the decedent's death.

The bill as amended provides that the changes made by it are to be applicable to estates of decedents dying after December 31, 1958.

This bill, as amended, is not opposed by the Treasury Department and has been reported unanimously by your committee. The revenue effect of this provision is believed to be insubstantial.

III. CHANGES IN EXISTING LAW

In compliance with clause 3 of Rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill, as introduced, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new matter is printed in italics, existing law in which no change is proposed is shown in roman):

INTERNAL REVENUE CODE OF 1954

SEC. 2056. BEQUESTS, ETC., TO SURVIVING SPOUSE.

(a) **Allowance of Marital Deduction.**—For purposes of the tax imposed by section 2001, the value of the taxable estate shall, except as limited by subsections (b), (c), and (d), be determined by deducting from the value of the gross estate an amount equal to the value of any interest in property which passes or has passed from the decedent to his surviving spouse, but only to the extent that such interest is included in determining the value of the gross estate.

(b) **Limitation in the Case of Life Estate or Other Terminable Interest.**—

(1) **General rule.**—Where, on the lapse of time, on the occurrence of an event or contingency, or on the failure of an event or contingency to occur, an interest passing to the surviving spouse will terminate or fail, no deduction shall be allowed under this section with respect to such interest—

(A) if an interest in such property passes or has passed (for less than an adequate and full consideration in money or money's worth) from the decedent to any person other than such surviving spouse (or the estate of such spouse); and

(B) if by reason of such passing such person (or his heirs or assigns) may possess or enjoy any part of such property after such termination or failure of the interest so passing to the surviving spouse;

and no deduction shall be allowed with respect to such interest (even if such deduction is not disallowed under subparagraphs (A) and (B))—

(C) if such interest is to be acquired for the surviving spouse, pursuant to directions of the decedent, by his executor or by the trustee of a trust.

For purposes of this paragraph, an interest shall not be considered as an interest which will terminate or fail merely because it is the ownership of a bond, note, or similar contractual obligation, the discharge of which would not have the effect of an annuity for life or for a term.

(2) **Interest in unidentified assets.**—Where the assets (included in the decedent's gross estate) out of which, or the proceeds of which, an interest passing to the surviving spouse may be satisfied include a particular asset or assets with respect to which no deduction would be allowed if such asset or assets passed from the decedent to such spouse, then the value of such interest passing to such spouse shall, for purposes of subsection (a), be reduced by the aggregate value of such particular assets.

(3) **Interest of spouse conditional on survival for limited period.**—For purposes of this subsection, an interest passing to

the surviving spouse shall not be considered as an interest which will terminate or fail on the death of such spouse if—

(A) such death will cause a termination or failure of such interest only if it occurs within a period not exceeding 6 months after the decedent's death, or only if it occurs as a result of a common disaster resulting in the death of the decedent and the surviving spouse, or only if it occurs in the case of either such event; and

(B) such termination or failure does not in fact occur.

(4) **Valuation of interest passing to surviving spouse.**—In determining for purposes of subsection (a) the value of any interest in property passing to the surviving spouse for which a deduction is allowed by this section—

(A) there shall be taken into account the effect which the tax imposed by section 2001, or any estate, succession, legacy, or inheritance tax, has on the net value to the surviving spouse of such interest; and

(B) where such interest or property is encumbered in any manner, or where the surviving spouse incurs any obligation imposed by the decedent with respect to the passing of such interest, such encumbrance or obligation shall be taken into account in the same manner as if the amount of a gift to such spouse of such interest were being determined.

(5) **Life estate with power of appointment in surviving spouse.**—In the case of an interest in property passing from the decedent, if his surviving spouse is entitled for life to all the income from the entire interest, or all the income from a specific portion thereof, payable annually or at more frequent intervals, with power in the surviving spouse to appoint the entire interest, or such specific portion (exercisable in favor of such surviving spouse, or of the estate of such surviving spouse, or in favor of either, whether or not in each case the power is exercisable in favor of others), and with no power in any other person to appoint any part of the interest, or such specific portion, to any person other than the surviving spouse—

(A) the interest or such portion thereof so passing shall, for purposes of subsection (a), be considered as passing to the surviving spouse, and

(B) no part of the interest so passing shall, for purposes of paragraph (1)(A), be considered as passing to any person other than the surviving spouse.

This paragraph shall apply only if such power in the surviving spouse to appoint the entire interest, or such specific portion thereof, whether exercisable by will or during life, is exercisable by such spouse alone and in all events.

(6) **Life insurance or annuity payments with power of appointment in surviving spouse.**—In the case of an interest in property passing from the decedent consisting of proceeds under a life insurance, endowment, or annuity contract, if under the terms of the contract such proceeds are payable in installments or are held by the insurer subject to an agreement to pay interest thereon (whether the proceeds, on the termination of any interest payments, are payable in a lump sum or in annual or more frequent

installments), and such installment or interest payments are payable annually or at more frequent intervals, commencing not later than 13 months after the decedent's death, and all amounts, or a specific portion of all such amounts, payable during the life of the surviving spouse are payable only to such spouse, and such spouse has the power to appoint all amounts, or such specific portion, payable under such contract (exercisable in favor of such surviving spouse or of the estate of such surviving spouse, or in favor of either, whether or not in each case the power is exercisable in favor of others), with no power in any other person to appoint such amounts to any person other than the surviving spouse—

(A) such amounts shall, for purposes of subsection (a), be considered as passing to the surviving spouse, and

(B) no part of such amounts shall, for purposes of paragraph (1)(A), be considered as passing to any person other than the surviving spouse.

This paragraph shall apply only if, under the terms of the contract, such power in the surviving spouse to appoint such amounts, whether exercisable by will or during life, is exercisable by such spouse alone and in all events.

(7) ***Allowance or award to surviving spouse.***—*For purposes of this subsection, an allowance or award made after the decedent's death pursuant to local law for the support of the surviving spouse during the settlement of the decedent's estate, shall not be considered as an interest which will terminate or fail to the extent that the allowance or award is in fact paid to the surviving spouse or to the estate of such spouse.*

* * * * * * *

(e) **Definition.**—For purposes of this section, an interest in property shall be considered as passing from the decedent to any person if and only if—

(1) such interest is bequeathed or devised to such person by the decedent;

(2) such interest is inherited by such person from the decedent;

(3) such interest is the dower or curtesy interest (or statutory interest in lieu thereof) of such person as surviving spouse of the decedent;

(4) such interest has been transferred to such person by the decedent at any time;

(5) such interest was, at the time of the decedent's death, held by such person and the decedent (or by them and any other person) in joint ownership with right of survivorship;

(6) The decedent had a power (either alone or in conjunction with any person) to appoint such interest and if he appoints or has appointed such interest to such person, or if such person takes such interest in default on the release or nonexercise of such power; **[**or**]**

(7) such interest consists of proceeds of insurance on the life of the decedent receivable by such person **[**.**]**; *or*

(*8*) *such interest is an allowance or award pursuant to local law for such person's support during the settlement of the decedent's estate.*

Except as provided in paragraph (5) or (6) of subsection (b), where at the time of the decedent's death it is not possible to ascertain the particular person or persons to whom an interest in property may pass from the decedent, such interest shall, for purposes of subparagraphs (A) and (B) of subsection (b)(1), be considered as passing from the decedent to a person other than the surviving spouse.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 819

IMPORTATION OF CERTAIN ARTICLES FOR RELIGIOUS PURPOSES

AUGUST 10, 1959.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. MILLS, from the Committee on Ways and Means, submitted the following

REPORT

[To accompany H.R. 4384]

The Committee on Ways and Means, to whom was referred the bill (H.R. 4384) to amend paragraph 1774 of the Tariff Act of 1930 with respect to the importation of certain articles for religious purposes, having considered the same, report favorably thereon with amendments and recommend that the bill as amended do pass.

The amendments are as follows:

Page 1, line 4, strike out "par. 1774)" and insert "par. 1774),".

Page 1, line 6, strike out "shrines mosaics, iconostas," and insert "shrines, mosaics, iconostases,".

Page 1, line 9, strike out "paris" and insert "Paris".

Page 1, lines 9 and 10, strike out "papier mache" and insert "papier-mâché".

PURPOSE

The purpose of H.R. 4384, as amended by your committee, it to add inconostases to the list of articles for which free entry is presently provided in paragraph 1774 of the Tariff Act of 1930, as amended; to provide for the free entry of adjuncts and appurtenances of the named articles whether to be physically joined thereto or not; and to extend the application of paragraph 1774 to cemeteries, schools, hospitals, orphanages, and similar nonprofit activities staffed and controlled by corporations or associations organized and operated for religious purposes.

GENERAL STATEMENT

At the present time paragraph 1774 of the Tariff Act of 1930, as amended, provides for the free entry of altars, pulpits, communion tables, baptismal fonts, shrines, mosaics, or parts of any of the fore-

going imported in good faith for the use of, either by order of, or for presentation (without charge) to, any corporation or association organized and operated exclusively for religious purposes. One purpose of your committee's bill is to add to the articles presently included in paragraph 1774, iconostases, which is a particular type of altar screen or partition.

Your committee has been advised that, generally speaking, the word "parts" contained in the present provisions of paragraph 1774 has been interpreted by the courts to refer to structural parts to be physically joined to the articles of which they are a part. Difficult interpretative questions have arisen in respect to present provisions in this respect. A second purpose of your committee's bill is to provide that articles which are appurtenances or adjuncts of the named articles, as well as parts thereof, shall be accorded the free entry privilege whether to be joined thereto or not, when imported under the conditions specified. Thus, articles concerning which certain interpretative questions have arisen, such as baldichinos, reredoses, tabernacles, alter predellas, altar cloths, altar screens, and altar candlesticks, which are not necessarily physically attached to or structural parts of altars, pulpits, communion tables, and other religious articles named in paragraph 1774, would be within the purview of the bill.

Your committee has also been advised that the limitation of the present paragraph 1774 to corporations or associations operated exclusively for religious purposes has raised difficult questions, such as the status of an altar imported for installation in a chapel in a hospital operated by a religious organization.

A third purpose of the bill is to accord the free-entry privilege to articles which are appurtenances or adjuncts of any of the above-named articles, as well as parts thereof, whether to be physically joined thereto or not, when imported in good faith for the use of, either by order of or for presentation (without charge) to, any corporation or association organized and operated for religious purposes, including cemeteries, schools, hospitals, orphanages, and similar non-profit activities staffed and controlled by such corprations or associations.

Thus, this bill, as reported, would be of material assistance to the Treasury Department in clearing up some of the difficult questions which have arisen.

Your committee received favorable reports on this legislation from the Departments of State, Labor, and Commerce and informative reports from the Departments of the Treasury and the U.S. Tariff Commission.

Your committee is unanimous in urging the enactment of this legislation.

CHANGES IN EXISTING LAW

In compliance with clause 3 of rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill, as introduced, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new matter is printed in italics, existing law in which no change is proposed is shown in roman):

PARAGRAPH 1774 OF THE TARIFF ACT OF 1930

TITLE II—FREE LIST

SECTION 201. That on and after the day following the passage of this Act, except as otherwise specially provided for in this Act, the articles mentioned in the following paragraphs, when imported into the United States or into any of its possessions (except the Virgin Islands, American Samoa, Wake Island, Midway Islands, Kingman Reef, Johnston Island, and the island of Guam), shall be exempt from duty:

* * * * * * *

PAR. 1774. Altars, pulpits, communion tables, baptismal fonts, shrines[,] mosaics, [or parts] *iconostas, or parts, appurtenances, or adjuncts* of any of the foregoing, *whether to be physically joined thereto or not*, and statuary (except casts of plaster of paris, or of compositions of paper or [papier-mache] *papier mache*), imported in good faith for the use of, either by order [of or] *of, or* for presentation (without charge) to, any corporation or association organized and operated [exclusively] for religious [purposes.] *purposes, including cemeteries, schools, hospitals, orphanages, and similar nonprofit activities staffed and controlled by such corporation or association.*

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59015°—59 H. Rept., 86-1, vol. 5——63

86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 820

TEMPORARY SUSPENSION OF DUTY ON BOOK BINDINGS AND COVERS IMPORTED BY CERTAIN INSTITUTIONS

AUGUST 10, 1959.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. MILLS, from the Committee on Ways and Means, submitted the following

REPORT

[To accompany H.R. 4576]

The Committee on Ways and Means, to whom was referred the bill (H.R. 4576) to transfer to the free list of the Tariff Act of 1930 book bindings or covers imported by certain institutions, having considered the same, report favorably thereon with amendments and recommend that the bill as amended do pass.

The amendments are as follows:

Page 1, strike out lines 6 to 9, inclusive, and insert:

> SEC. 2. The amendment made by the first section of this Act shall apply with respect to articles entered, or withdrawn from warehouse, for consumption during the two-year period beginning on the date of the enactment of this Act and to articles covered by entries or withdrawals which have not been liquidated or the liquidation of which has not become final on such date of enactment.

Amend the title to read as follows:

> A bill to suspend for a temporary period the duty on book bindings and covers imported by certain institutions.

PURPOSE

The purpose of H.R. 4576, as reported, is to suspend for a period of 2 years from the date of enactment the duties imposed on book bindings or covers imported by certain institutions.

GENERAL STATEMENT

Your committee's bill would amend paragraph 1631(a) of the free list of the Tariff Act of 1930 to include therein "book bindings or covers" and to provide for the duty-free treatment of such imports for a period of 2 years from the date of enactment of the bill.

Paragraph 1631(a), as amended, now provides for duty-free treatment of books, charts, engravings, etchings, lithographic prints, maps, music, sound recordings, slides and transparencies, and photographs, imported by educational, literary, and other institutions for their own use or for the encouragement of the fine arts and not for sale.

Section 2 of Public Law 694, 83d Congress, amended paragraph 1631 to include book bindings or covers for a 2-year period (to September 1, 1956). The period was extended until September 1, 1958, by section 4 of Public Law 723, 84th Congress. Since September 1, 1958, bookbindings and book covers have been subject to duty. H.R. 4576 would provide for the same duty-free treatment provided for under the enactments referred to above. The 2-year period would run from the date of enactment of the bill. In addition, the bill will apply with respect to articles covered by entries or withdrawals which have not been liquidated or the liquidation of which has not become final on the date of enactment.

Your committee received favorable reports on this legislation from the Departments of State, Treasury, and Commerce, and an informative report from the U.S. Tariff Commission. The U.S. Tariff Commission advised that it was not aware of any complaints against imports under the previous temporary duty exemption.

Your committee is unanimous in recommending the enactment of H.R. 4576.

CHANGES IN EXISTING LAW

In compliance with clause 3 of rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill, as introduced, are shown as follows (new matter is printed in italic, existing law in which no change is proposed is shown in roman):

PARAGRAPH 1631(a) OF THE TARIFF ACT OF 1930, AS AMENDED

TITLE II—FREE LIST

SECTION 201. That on and after the day following the passage of this Act, except as otherwise specially provided for in this Act, the articles mentioned in the following paragraphs, when imported into the United States or into any of its possessions (except the Virgin Islands, American Samoa, Wake Island, Midway Islands, Kingman Reef, Johnston Island, and the island of Guam), shall be exempt from duty:

* * * * * * *

Par. 1631. (a) Any society or institution incorporated or established solely for religious, philosophical, educational, scientific, or literary purposes, or for the encouragement of the fine arts, or any college, academy, school, or seminary of learning in the United States, or any State or public library, may import free of duty any book, *book binding or cover*, map, music, sound recordings, slides and transparencies, engraving, photograph, etching, lithographic print, or chart, for its own use or for the encouragement of the fine arts, and not for sale, under such rules and regulations as the Secretary of the Treasury may prescribe.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 821

REPEAL OF EXCISE TAX ON AROMATIC CACHOUS

AUGUST 10, 1959.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. MILLS, from the Committee on Ways and Means, submitted the following

REPORT

[To accompany H.R. 4586]

The Committee on Ways and Means, to whom was referred the bill (H.R. 4586) to amend section 4021 of the Internal Revenue Code of 1954, having considered the same, report favorably thereon without amendment and recommend that the bill do pass.

I. PURPOSE OF THE BILL

This bill amends section 4021 of the Internal Revenue Code of 1954, which provides a 10-percent excise tax on certain toilet preparations, by striking out the words "aromatic cachous." The bill as reported by your committee provides that this change is to be effective as of the 1st of the month beginning more than 10 days after the date of enactment of this bill. The bill, which the Tresaury Department indicated that it favors, has been reported unanimously by your committee.

II. REASONS FOR BILL

Aromatic cachous are aromatic pellets, such as Sen Sen, made of licorice, cashew nuts, gum, etc., which are chewed for the purpose of sweetening the breath.

Your committee believes that aromatic cachous should not be taxed as toilet preparations since they are more nearly like mouthwashes and candied mints than like the externally applied toilet preparations which comprise the rest of the articles subject to the toilet preparations tax. Moreover, the tax on aromatic cachous places them at a competitive disadvantage with nontaxed articles purchased for similar use. Still another reason for not subjecting aromatic cachous to tax is the fact that they are usually sold in

candy stores, confectioneries, and other shops which do not handle other articles subject to the toilet preparations tax. As a result the proprietors of these stores are burdened with the requirement of collecting and remitting negligible amounts of tax. This fact has in many cases discouraged proprietors from handling aromatic cachous.

It is estimated that the revenue effect of this change in the base of the tax on toilet preparations will be negligible.

This bill, on which the Treasury made a favorable report, has been reported unanimously by your committee.

CHANGES IN EXISTING LAW

In compliance with clause 3 of rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill, as introduced, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, existing law in which no change is proposed is shown in roman):

SECTION 4021 OF THE INTERNAL REVENUE CODE OF 1954

SEC. 4021. IMPOSITION OF TAX.

There is hereby imposed upon the following articles sold at retail a tax equivalent to 10 percent of the price for which so sold—

Perfume.
Essences.
Extracts.
Toilet waters.
Cosmetics.
Petroleum jellies.
Hair oils.
Pomades.
Hair dressings.
Hair restoratives.
Hair dyes.
[Aromatic cachous.]
Toilet powders.

Any other similar substance, article, or preparation, by whatsoever name known or distinguished; any of the above which are used or applied or intended to be used or applied for toilet purposes.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 822

CONVEYING CERTAIN LANDS IN SALT LAKE COUNTY, UTAH, TO THE METROPOLITAN WATER DISTRICT OF SALT LAKE CITY

AUGUST 10, 1959.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. ROGERS of Texas, from the Committee on Interior and Insular Affairs, submitted the following

REPORT

[To accompany H.R. 5270]

The Committee on Interior and Insular Affairs, to whom was referred the bill (H.R. 5270) to authorize the Secretary of the Interior to convey to the Metropolitan Water District of Salt Lake City, Utah, all right, title, and interest of the United States in certain lands located in Salt Lake County, Utah, having considered the same, report favorably thereon without amendment and recommend that the bill do pass.

PURPOSE

H.R. 5270, introduced by Representative King of Utah, would authorize the Secretary of the Interior to convey to the Metropolitan Water District of Salt Lake City, Utah, all right, title, and interest of the United States in a 7.7-acre tract of land which was originally donated by the district to the United States specifically for use in connection with construction of the Provo River Federal reclamation project.

EXPLANATION AND NEED

In 1949, when the metropolitan water district donated this tract of land to the United States, the plans for the aqueduct division of the Provo River Federal reclamation project called for use of the tract for project purposes. The donation was made by the district with the informal understanding that any portion of the land not used for project purposes would be reconveyed to it. Due to a change in the project plan, this 7.7-acre tract has not been used. It is not required for any other needs of the Bureau of Reclamation. The metropolitan water district wants to use the land as an administrative headquarters site for the operation of the project.

This legislation is necessary to permit reconveyance to the district without regard to the requirements of the Federal Property and Administrative Services Act, as amended. That act would require the Department to give other Federal departments and agencies a prior right to request a transfer of the property to one of them before it could be reconveyed and there is no assurance that some Federal agency would not make such a request.

COST

Enactment of this bill would not result in any cost to the Federal Government.

COMMITTEE'S RECOMMENDATION

The Committee on Interior and Insular Affairs recommends that H.R. 5270 be enacted.

DEPARTMENT'S REPORT

The report of the Department of the Interior recommending enactment of H.R. 5270 follows.

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington, D.C., July 22, 1959.

Hon. WAYNE N. ASPINALL,
Committee on Interior and Insular Affairs,
House of Representatives, Washington, D.C.

DEAR MR. ASPINALL: This responds to your request for the views of this Department on H.R. 5270, a bill to authorize the Secretary of the Interior to convey to the Metropolitan Water District of Salt Lake City, Utah, all right, title, and interest of the United States in certain lands located in Salt Lake County, Utah.

We recommend that the bill be enacted.

As the title of H.R. 5270 indicates, the bill would authorize the Secretary of the Interior to convey to the Metropolitan Water District of Salt Lake City, Utah, all its interest in a 7.7-acre tract of land described in the bill. This land was acquired by the district and conveyed to the United States by a donation warranty deed, dated September 14, 1949, specifically for project purposes of the Aqueduct division of the Provo River Federal reclamation project.

The donation was made by the district with the informal understanding that any portion of the land not used for project purposes would be reconveyed to it. Due to a change in project plans, the land described in the bill was not so used and is not required for any other needs of the Bureau of Reclamation.

Subsection Q of section 4, Second Deficiency Act, fiscal year 1924 (43 Stat. 672, 704, 43 U.S.C., sec. 376), would authorize the Secretary to make the proposed conveyance by administrative action. However, the Federal Property and Administrative Services Act of 949 (63 Stat. 377), as amended, particularly by the act of September 5, 1950 (64 Stat. 578), which makes its provisions with respect to the disposal of Federally owned property "in addition and paramount to

any authority conferred by any other law," including the provisions of said subsection Q, section 4, of the 1924 act, requires this Department to give other Federal departments and agencies a prior right to request a transfer of the property to one of them before it could be reconveyed to the District pursuant to subsection Q. Thus there would be no assurance under that authority that some Federal agency would not make such a request, thereby precluding a reconveyance of the land to the district. The enactment of H.R. 5270 will permit this Department to make the conveyance to the district without regard to the requirements of the Federal Property and Administrative Services Act, as amended, and thereby avoid the possibility of nullifying the intention underlying the original conveyance to the Government by a disposal of the land to a party other than the district.

The Bureau of the Budget has advised that there would be no objection to the submission of this report to your committee.

Sincerely yours,

FRED G. AANDAHL,
Assistant Secretary of the Interior.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 823

EXTENSION OF TEMPORARY FREE IMPORTATION OF CASEIN

AUGUST 10, 1959.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. MILLS, from the Committee on Ways and Means, submitted the following

REPORT

[To accompany H.R. 7456]

The Committee on Ways and Means, to whom was referred the bill (H.R. 7456) to extend for 3 years the suspension of duty on imports of casein, having considered the same, report favorably thereon with an amendment and recommend that the bill as amended do pass.

The amendment is as follows:

Page 1, line 7, strike out " '1963'." and insert: "1963".

PURPOSE

The purpose of H.R. 7456, as amended, is to extend for 3 years—that is, until the close of March 31, 1963—the suspension of import duties imposed on casein under paragraph 19 of the Tariff Act of 1939, as amended. The present suspension, provided for by Public Law 85–257, will expire at the close of March 31, 1960.

GENERAL STATEMENT

Casein or lactarene is provided for in paragraph 19, of title I, of the Tariff Act of 1930, as amended. Under the provision of Public Law 85–257 the duty on casein was suspended from September 3, 1957, through the close of March 31, 1960. Your committee's bill, H.R. 7456, would continue this suspension of duty for a period of 3 years until the close of March 31, 1963.

Available official statistics on domestic production and imports of casein do not distinguish between the edible and inedible product. However, your committee is informed by the U.S. Tariff Commission that it is believed that the domestic production consists almost entirely

of edible casein and casein derivatives while imports consist almost entirely of inedible or industrial casein. Industrial casein is used principally in the manufacture of coated paper, glues, coldwater paints, mucilage-type adhesives, and other less extensive uses.

Information further presented to your committee shows that domestic production of casein has shown a trend of decline whereas the general trend of imports of casein has been upward for a number of years. Domestic production of casein has not reflected changes in demand in recent years because the raw material from which casein is made (skim milk) frequently is more profitably converted into other products. Since 1952, the milk price-support program has constituted a material inducement for converting skim milk into products other than casein.

Favorable reports were received on this legislation from the Departments of Agriculture, Labor, and Commerce, and informative reports from the Treasury Department and the U.S. Tariff Commission. The report of the Labor Department stated that the "Department is not aware of any unfavorable developments resulting from the free importation of casein * * *", and the Department of Agriculture, after pointing out that Public Law 85–257 had afforded a testing period of approximately 3 years, likewise found no unfavorable developments and interposed no objection to the bill.

Your committee is unanimous in recommending the enactment of H.R. 7456.

CHANGES IN EXISTING LAW

In compliance with clause 3 of rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill, as introduced, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new matter is printed in italics, existing law in which no change is proposed is shown in roman):

ACT OF SEPTEMBER 2, 1957

AN ACT To amend the Tariff Act of 1930 to provide for the temporary free importation of casein

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the import duty imposed under paragraph 19 of title I of the Tariff Act of 1930, as amended, shall be suspended with respect to imports entered for consumption or withdrawn from warehouse for consumption during the period beginning with the day following the date of enactment of this Act and ending with the close of March 31, [1960] *1963*.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 824

NATIONAL MEDAL OF SCIENCE

AUGUST 10, 1959.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. ANFUSO, from the Committee on Science and Astronautics, submitted the following

REPORT

[To accompany H.R. 6288]

The Committee on Science and Astronautics, to whom was referred the bill (H.R. 6288) to establish a National Order of Science to provide recognition for individuals who make outstanding contributions in science and engineering, having considered the same, report favorably thereon with amendments and recommend that the bill as amended do pass.

The amendments are as follows:

Strike out all after the enacting clause and insert the following:

That (a) there is hereby established the National Medal of Science (hereinafter referred to as the "Medal"), to be awarded as provided in section 2 of this Act.

(b) Each individual awarded the Medal shall receive an award consisting of (1) an appropriate medal, to be known as the National Medal of Science, of such design and bearing such inscriptions as the President, on the basis of recommendations submitted by the National Science Foundation, may prescribe, and (2) a lump-sum payment of such amount, not to exceed $10,000, as the President may prescribe in the case of each individual awarded the Medal.

SEC. 2 (a) The President shall from time to time award the Medal, on the basis of recommendations received from the National Academy of Sciences or on the basis of such other information and evidence as he deems appropriate, to individuals who in his judgment are deserving of special recognition by reason of their outstanding contributions to knowledge in the physical, biological, mathematical, or engineering sciences.

(b) Not more than twenty individuals may be awarded the Medal in any one calendar year.

(c) An individual may not be awarded the Medal unless at the time such award is made he—

(1) is a citizen or other national of the United States; or

(2) is an alien lawfully admitted to the United States for permanent residence who (A) has filed an application for petition for naturalization in the manner prescribed by section 334(b) of the Immigration and Nationality Act and (B) is not permanently ineligible to become a citizen of the United States.

(d) The presentation of the award shall be made by the President with such ceremonies as he may deem proper, including attendance by appropriate Members of Congress.

SEC. 3. Notwithstanding any other law of the United States, or any law of a State, Territory, Commonwealth, or possession of the United States, no part of the sum referred to in clause (2) of subsection (b) of the first section of this Act shall be assignable, or be subject to any tax or to garnishment, attachment, or other legal process, under any circumstances whatsoever, nor shall the payment thereof be anticipated.

SEC. 4. There are authorized to be appropriated such sums as may be necessary to carry out this Act.

Amend the title so as to read:

A bill to establish a National Medal of Science to provide recognition for individuals who make outstanding contributions in the physical, biological, mathematical, and engineering sciences.

EXPLANATION OF AMENDMENTS

The above amendments were made by the committee for the following reasons:

(1) Since the proposed "Order" of Science was thought to connote special privilege, the committee agreed to confine the award to a medal and a cash payment;

(2) The National Academy of Sciences rather than any Government agency was designated as the principal organization to recommend the recipients of awards, because it was considered more objective and more representative of the scientific community;

(3) The criteria for the award were broadened so as to include the biological, mathematical, and engineering as well as physical sciences;

(4) U.S. nationals, as well as citizens and qualified applicants for citizenship, were made eligible to receive the award, in order to include everyone owing allegiance to the United States;

(5) The provision requiring approval by House and Senate committees before the President conferred an award was considered unnecessary and tending to restrict the President's freedom of action;

(6) The provision for a special award for the first astronaut was regarded as inappropriate to the other provisions of the bill.

PURPOSE OF THE BILL

The purpose of H.R. 6288, a bill to establish a National Medal of Science to provide recognition for individuals who make outstanding contributions in the physical, biological, mathematical, and engineering sciences, is to encourage scientific and technical research and achievements which contribute to the security of the United States or the progress of mankind. For this purpose it is hoped that the bill, by giving greater recognition to individual achievements, will encourage young people to undertake the necessary training and to follow careers in science and engineering, and will focus public attention on the national need for scientific and engineering effort.

NEED FOR THE LEGISLATION

In this age of space flight and nuclear energy, progress in science and engineering is vital to the safety as well as the continued economic growth and prosperity of every nation. For many years, American supremacy in science and engineering seemed beyond challenge. In fact, this preeminence was so well established that many Americans assumed it would continue indefinitely without planning or effort.

Then, in October of 1957, the launching by the Soviet Union of the first artificial earth satellite sent a shock throughout the country. Together with other evidence, such as the Soviet ability to develop nuclear weapons more quickly than had been supposed, Sputnik I indicated that the time had come for the United States to look to its scientific laurels. In the ensuing reappraisal, many responsible Americans concluded that our education was deficient both in intensity and in scientific content, and that too few of our young people were undertaking training and careers in science and engineering. These conclusions were bolstered by statistics of curriculums, enrollments, and degrees in the scientific and engineering disciplines. In the first year after Sputnik I, for example, a drop of 11 percent occurred in engineering enrollments.

In this situation, it seemed necessary to provide additional incentives for scientific achievement. Since scientific and engineering progress were essential to our safety and prosperity, and there were indications that it was lagging, at least in relative terms, the problem was chiefly to call forth the necessary individual decisions and efforts. If the United States was to keep its lead in science, especially in critical fields including astronautics, additional incentives were needed to encourage our people to take scientific training and do scientific work.

The President had reached this conclusion even before Sputnik I. As early as January 6, 1955, in his state of the Union message, he recommended that—

> awards of merit be established whereby we can honor our fellow citizens who make great contributions to the advancement of our civilization and to this country.

For this purpose, a draft bill was transmitted to the Congress on April 19, 1955, by the Secretary of Health, Education, and Welfare. The House Education and Labor Committee reported H.R. 11923 favorably to the House, which passed the bill on July 2, 1956. The Senate, however, took no action, and the legislation lapsed at the expiration of the 84th Congress. Similar legislation (H.R. 488) was introduced in the 85th Congress, and was again reported favorably by the House Education and Labor Committee and passed by the House. Again, however, the Senate took no action, and the legislation lapsed.

On March 29, 1957, the President's Special Committee on Civilian National Honors recommended a medal for especially meritorious civilian achievement. The President's Committee concluded that such a medal was both desirable and consistent with the traditions of the United States.

A number of general awards for civilian achievement have already been authorized by Congress. Since 1905, for example, the President has been authorized to bestow a medal upon any person who heroically saves or attempts to save lives in connection with railroad disasters (45 U.S.C.. secs. 44 et seq.). The President is also authorized to present a medal to any airmail pilot who distinguishes himself by heroic or extraordinary achievement in the performance of his duties (39 U.S.C., sec. 830). The Secretary of the Treasury may award a medal to any person who rescues any other person from drowning, shipwreck, or other peril of water, if such rescue is performed under certain conditions (14 U.S.C., sec. 500). The Department of Justice may promulgate rules and regulations for awarding the Young Amer-

ican Medal for Bravery to persons 18 or under who show courage, swift action, and so forth, in saving a life that was in imminent danger, or the Young American Medal for Service to persons 18 or under who are outstanding in character and service (42 U.S.C., secs. 1921 et seq.). In addition, the President has been authorized to award the Medal for Merit to civilians who have distinguished themselves by especially meritorious conduct in connection with World War II (10 U.S.C., sec. 1408(b)(2)).

The foregoing examples show that awards for civilian achievement are acceptable to Congress and the American people. Special awards have been made to named individuals for their scientific and engineering contributions—for example, to Thomas A. Edison (H.J. Res. 243, 70th Cong.) and Dr. Jonas Salk (H.J. Res. 278, 84th Cong.). There is, however, no general award for achievement in science and engineering. The President's Special Committee concluded that adequate provision for an award for civilian achievement requires legislation.

PRINCIPAL PROVISIONS

The principal provisions of H.R. 6288 are as follows:

Section 1 establishes a National Medal of Science, each recipient of which shall be awarded an appropriate medal and a lump-sum payment not to exceed $10,000, as the President may prescribe.

It is left to the President's discretion whether to award one or more kinds or degrees of the medal, and how large a payment (not in excess of $10,000), to make to each recipient. The committee decided against creating an "Order" or other association of award winners, while recognizing that recipients of the medal might choose by voluntary action to form such an association

Section 2 provides that the President shall from time to time award the medal, on the basis of recommendations received from the National Academy of Sciences or on the basis of such other information and evidence as he deems appropriate, to U.S. nationals or qualified applicants for naturalization, not to exceed 20 in any calendar year, who in his judgment deserve special recognition for their outstanding contributions to knowledge in the physical, biological, mathematical, or engineering sciences.

Although the National Academy of Sciences is designated as the recommending body, because of its relative objectivity and because it represents the entire scientific community, the committee intends that recommendations may also be made by any Government agency and by any scientific or engineering society. The President will thus have complete latitude in selecting the recipients of awards. At the same time, it is contemplated that he will rarely reject a recommendation made by the National Academy of Sciences, and will even more rarely confer the medal on any person not recommended by the National Academy of Sciences.

While the medal may be awarded posthumously, the committee intends that posthumous awards shall not be made except for relatively recent achievements of current significance.

Aliens are not eligible to receive the medal, since the purpose of the bill is to encourage scientific and engineering education and accomplishment in the United States. It is noted that the President in his message of January 6, 1955, recommended that civilian awards of merit be made to "our fellow citizens."

After considering all aspects of the problem, the committee broadened the criteria for the award so as to include outstanding contributions in "the physical, biological, mathematical, or engineering sciences." This language is intended to comprehend (without being limited to) chemistry as well as physics, health and medicine, and agricultural science. The committee rejected proposals that the criteria be further broadened, so that the medal might be awarded for achievement in public affairs, education, letters, arts, law, or other intellectual and cultural pursuits.

The committee contemplates that the President will make every effort to present the awards himself, probably once a year, at proper ceremonies attended by Government officials, including appropriate Members of Congress, and other prominent citizens.

Section 3 exempts the payments made to recipients of the medal from taxation, assignment, and legal process.

Section 4 authorizes the appropriation of such sums as may be necessary to carry out the act.

CONCLUSIONS

The committee believes that further progress in science and engineering are assential to the safety and prosperity of the United States; that additional incentives are needed to encourage scientific and engineering education and accomplishment; that H.R. 6288 will help materially to provide such incentives, and will establish an orderly method for providing such incentives without the necessity for special resolutions or acts of Congress. The committee further believes that enactment of the bill will stimulate scientific and engineering activity, encourage education and the choice of careers in the natural sciences and engineering, and thus promote economic and cultural progress and strengthen the security of the United States.

COMMITTEE RECOMMENDATIONS

A quorum being present, the committee favorably reported the bill by unanimous vote and recommends its enactment.

COST AND BUDGET DATA

It is estimated that the cost of the bill will not exceed $200,000 annually.

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DEPARTMENT RECOMMENDATIONS

The National Science Foundation is in accord with the general purposes of the bill and the Bureau of the Budget indicates no objection as is shown by the following letter:

NATIONAL SCIENCE FOUNDATION,
OFFICE OF THE DIRECTOR,
Washington, D.C., June 17, 1959.

Mr. CHARLES F. DUCANDER,
Executive Director and Chief Counsel, House Committee on Science and Astronautics, House of Representatives, Washington, D.C.

DEAR MR. DUCANDER: This is in reply to your recent request for the comments of the National Science Foundation on H.R. 6288, a bill to establish a National Order of Science to provide recognition for individuals who make outstanding contributions in science and engineering.

The National Science Foundation is in accord with the objective of recognizing persons who have distinguished themselves through outstanding achievements in various fields. As a general matter, however, we believe that such recognition should be given for distinguished achievement in a broader number of fields than science and engineering. Science is but one element of our culture, and a vigorous culture can result only if support is provided for all of its intellectual activities.

Thank you for giving us the opportunity to comment on the bill. The Bureau of the Budget has advised us it has no objection to the submission of this report.

Sincerely yours,

ALAN T. WATERMAN, *Director.*

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 825

EXPRESSING THE SENSE OF CONGRESS AGAINST SEATING OF THE COMMUNIST REGIME IN CHINA AS REPRESENTATIVE OF CHINA IN THE UNITED NATIONS

AUGUST 10, 1959.—Referred to the House Calendar and ordered to be printed

Mr. ZABLOCKI, from the Committee on Foreign Affairs, submitted the following

REPORT

[To accompany H. Con. Res. 369]

The Committee on Foreign Affairs, to whom was referred the concurrent resolution (H. Con. Res. 369) expressing the sense of the Congress against the seating of the Communist regime in China as the representative of China in the United Nations, having considered the same, report favorably thereon without amendment and recommend that the concurrent resolution do pass.

House Concurrent Resolution 369 was introduced by Hon. Clement J. Zablocki on July 30, 1959, and referred to the Committee on Foreign Affairs. An identical resolution (H. Con. Res. 368) was introduced by Hon. Walter H. Judd and similarly referred on the same day. The committee met in executive session August 4, 1959, to consider these measures and ordered reported House Concurrent Resolution 369 by a vote of 22 to 1.

The Mutual Security appropriation bill for 1960 included a section expressing opposition to the seating in the United Nations of the Communist regime in China as the representative of China. On a point of order this section was stricken as being legislation in an appropriation bill. Thereupon Representatives Zablocki and Judd introduced their concurrent resolutions.

Since 1948 the House on 15 occasions has approved language condemning the admission of the Communist regime in China into the United Nations and its specialized agencies. These expressions have been contained in simple and concurrent resolutions as well as in legislative acts. In addition, four reports made to the House by the subcommittees of the Committee on Foreign Affairs have contained similar expressions.

In its report accompanying a similar measure in 1956 the committee made this statement:

> The members of the Communist regime in China are exerting continuous effort to gain admission into the United Nations and its specialized agencies as the representatives of China. At a time when these efforts are being intensified by the Communist bloc and supported by some others, it is particularly important to restate and reemphasize the overwhelming sentiment of the United States as expressed by its people, by its Congress, and by its President.

Nothing has happened in the intervening years to alter that observation. There is still the persistent search by the Communist regime in China for respectability, and the increased prestige and influence that will accrue to it from membership in an organization devoted to the peaceful settlement of international disputes. That regime's ruthless suppression of Tibet only a few months ago gives incontrovertible evidence that it still uses force as its normal practice in international conduct.

Intermittently throughout this congressional session the Subcommittee on the Far East and the Pacific has reviewed with responsible officials developments in the Far East. Most recently on July 27, 1959, it held a meeting to which all committee members were invited. The purpose was to review the current situation in that area. It was pointed out by the Assistant Secretary of State for the Far East, Hon. J. Graham Parsons, that the resistance of the United States and the Republic of China to Communist China's use of force in the Taiwan Straits has had a salutary effect throughout the Far East. Our Ambassadors to Far Eastern nations, meeting recently at Baguio in the Philippine Islands with Under Secretary Dillon, Assistant Secretary Parsons, Admiral Felt, commander in chief of all our forces in the Pacific, and other U.S. officials agreed that the U.S. policy of supporting the Republic of China and rejecting recognition of Communist China should be continued. They reported that this policy and the reasons for it are becoming better understood in the area, especially following Communist China's attack on Tibet.

It is expected that the question of Communist China's admission into the United Nations will be renewed at the meeting of the United Nations General Assembly this fall. The deletion from an appropriation bill of congressional sentiment on this subject may be misunderstood by those not familiar with our parliamentary procedure. The single purpose of this resolution is to reaffirm the attitude of the American people on this matter as reflected by their elected representatives. Its passage will make readily evident that there has been no departure from our previous policy. Despite the differences that may divide our people on other issues, they are overwhelmingly united in their determination that unless and until the Communist regime in China is willing to agree in a dependable way to "refrain from the threat or use of force" in international disputes, it must be deemed unwilling to uphold the principles of the United Nations and therefore ineligible for admission to a seat in that organization.

MINORITY VIEWS

The passage of House Concurrent Resolution 369 at this time is neither wise nor necessary because—

(1) The subject is covered in the Mutual Security Act.

(2) No hearings were held on the subject in 1959.

(3) Any related testimony heard in connection with other bills was incidental and of no consequence because it did not apply directly to House Concurrent Resolution 369 and especially because opposing viewpoints were not heard.

(4) Many months were available to present such a resolution if its passage was urgent or important. No reasonable grounds exist for hasty action. Either it is important enough for adequate review or it is not important enough for special attention.

(5) Therefore, it was ill-advised to push House Concurrent Resolution 369 through committee on August 4, with approximately an hour of discussion, when it had only been introduced on July 30. A resolution dealing with such a complicated subject should not have been brought up for a quick decision, particularly because no specific advance notice was given. Furthermore, little attention was given to the opinions of at least six committee members who regarded the resolution as unnecessary or who questioned the wisdom of hasty action.

WILLIAM H. MEYER.

AUGUST 10, 1959.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 826

EXTENDING THE TIME FOR COMMENCING AND COMPLETING THE CONSTRUCTION OF CERTAIN PROJECTS BY THE STATE OF MICHIGAN

AUGUST 10, 1959.—Referred to the House Calendar and ordered to be printed

Mr. MORGAN, from the Committee on Foreign Affairs, submitted the following

REPORT

[To accompany H.R. 3180]

The Committee on Foreign Affairs, to whom was referred the bill (H.R. 3180), to extend for an additional 3 years the time within which the State of Michigan may commence and complete the construction of certain projects heretofore authorized by the Congress, having considered the same, report favorably and unanimously thereon with an amendment and recommend that the bill, as amended, do pass.

The amendment is as follows:

Strike out all after the enacting clause and insert in lieu thereof the following:

That the Act entitled "An Act authorizing the State of Michigan, acting through The International Bridge Authority of Michigan, to construct, maintain, and operate a toll bridge or series of bridges, causeways, and approaches thereto, across the Saint Marys River, from a point in or near the city of Sault Sainte Marie, Michigan, to a point in the Province of Ontario, Canada", approved December 16, 1940 (54 Stat. 1222; Public Law 889, Seventy-sixth Congress), is hereby revived and reenacted: *Provided*, That this Act shall be null and void unless the actual construction of the bridge, or series of bridges, causeways, and approaches thereto, referred to in such Act of December 16, 1940, is commenced within three years, and completed within six years, from the date of enactment of this Act.

SEC. 2. The right to alter, amend, or repeal this Act is hereby expressly reserved.

H.R. 3180 was introduced by the Honorable Victor A. Knox and referred to the Committee on Foreign Affairs on January 22, 1959. The committee considered the measure in executive session on August 4, 1959, and ordered it reported with an amendment.

By an act of Congress, approved December 16, 1940 (54 Stat. 1222; Public Law 889, 76th Congress), the State of Michigan was authorized

to act through the International Bridge Authority to construct and operate a series of toll bridges, causeways, and approaches across the St. Marys River from a point in or near the city of Sault Ste. Marie, Mich., to a point in the Province of Ontario, Canada, subject to the provisions of the 1906 Bridge Act. The act of December 16, 1940, was subject to section 6 of the 1906 act (33 U.S.C. 496), which provided that the authority would expire unless the construction of the bridge was initiated within a year and completed within 3 years from the date of enactment.

The 1940 authorization act was revived and reenacted by the act of March 23, 1942 (56 Stat. 174; Public Law 504, 77th Cong.). In 1953, it was necessary again to revive and reenact the 1940 act. The act was so revived and reenacted by the act of July 28, 1953 (67 Stat. 225, Public Law 157, 83d Cong.); this act was further extended by the act of May 18, 1956 (70 Stat. 159; Public Law 530, 84th Cong.). The authority for construction of the bridge expired on July 28, 1959; it is therefore necessary to revive and reenact the 1940 act.

The reasons for the delay in the construction of the bridge were due to wartime restrictions and the determination of proper sites in Michigan and Canada.

The reported bill will revive and reenact the 1940 act, but the authority will expire unless the construction of the bridges, causeways, and approaches are initiated within 3 years, and completed within 6 years, from the date of enactment of the reported bill.

Letters from the Department of State and the Secretary of the Army indicate there is no objection to the enactment of this bill.

DEPARTMENT OF STATE,
Washington, July 20, 1959.

Hon. THOMAS E. MORGAN,
Chairman, Committee on Foreign Affairs,
House of Representatives.

DEAR DR. MORGAN: I refer to your letter dated July 1, 1959, requesting the comments of the Department of State on H.R. 3180, a bill to extend for an additional 3 years the time within which the State of Michigan may commence and complete the construction of certain projects heretofore authorized by the Congress.

I am pleased to inform you that the Department has no objection to the enactment of the above-mentioned bill.

The Department has been informed by the Bureau of the Budget that there is no objection to the submission of this report.

Sincerely yours,

WILLIAM B. MACOMBER, Jr.,
Assistant Secretary
(For the Acting Secretary of State).

DEPARTMENT OF THE ARMY,
Washington, D.C., July 21, 1959.

Hon. THOMAS E. MORGAN,
Chairman, Committee on Foreign Affairs,
House of Representatives.

DEAR MR. CHAIRMAN: Reference is made to your request for the views of the Department of the Army with respect to H.R. 3180, 86th Congress, a bill to extend for an additional 3 years the time

within which the State of Michigan may commence and complete the construction of certain projects heretofore authorized by the Congress.

The act of Congress approved December 16, 1940 (54 Stat. 1222), authorized the State of Michigan acting through the International Bridge Authority of Michigan to construct and operate a series of toll bridges, causeways and approaches thereto across the Saint Marys River from a point in or near the city of Sault Sainte Marie to a point in the Province of Ontario, Canada, in accordance with the provisions of the act approved March 23, 1906 (34 Stat. 84), pertaining to the regulation of the construction of bridges over navigable waters. The act of July 28, 1953 (67 Stat. 226), revived and reenacted the 1940 act, and, as amended by the act of May 18, 1956 (70 Stat. 150), the existing authorization provides that the State must commence and complete construction by July 28, 1959, and July 28, 1962, respectively.

This bill, H.R.3180, would further extend the times for commencement and completion of the works to July 28, 1962, and July 28, 1965. respectively.

The Department of the Army interposes no objection to the anactment of H.R. 3180.

Enactment of this bill would not result in the expenditure of Federal funds.

The Bureau of the Budget advises that there is no objection to the submission of this report.

Sincerely yours,

WILBER M. BRUCKER,
Secretary of the Army.

No Federal funds are involved.

CHANGES IN EXISTING LAW

In compliance with clause 3 of rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill, as introduced, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new matter is printed in italic, existing law in which no change is proposed is shown in roman):

Public Law 157—83d Congress, as Amended, Chapter 252—1st Session, H.R. 4302

AN ACT To revive and reenact the Act entitled "An Act authorizing the State of Michigan, acting through the International Bridge Authority of Michigan, to construct, maintain, and operate a toll bridge or series of bridges, causeways, and approaches thereto, across the Saint Marys River, from a point in or near the city of Sault Sainte Marie, Michigan, to a point in the Province of Ontario, Canada", approved December 16, 1940.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Act approved December 16, 1940, authorizing the State of Michigan, acting through the International Bridge Authority of Michigan, to construct, maintain, and operate a toll bridge or series of bridges, causeways, or tunnel and approaches thereto, across the Saint Marys River, from a point in or near the city of Sault Sainte Marie, Michigan, to a point in the Province of Ontario, Canada, be, and is hereby, revived and reenacted: *Provided*, That this Act shall be null and void unless the actual construction of the bridge, or series of bridges, causeways, and approaches

thereto, referred to in this Act, is commenced on or before July 28, [1959] *1962*, and completed on or before July 28, [1962] *1965*.

SEC. 2. The right to alter, amend, or repeal this Act is hereby expressly reserved.

Approved July 28, 1953.

APPENDIX

ACT OF DECEMBER 16, 1940

For the information of Members of the House, the act of December 16, 1940, which is revived and reenacted by the bill, as amended, is set forth below:

[PUBLIC—No. 889—76TH CONGRESS]

[CHAPTER 929—3D SESSION]

[S. 3934]

AN ACT Authorizing the State of Michigan, acting through The International Bridge Authority of Michigan, to construct, maintain, and operate a toll bridge or series of bridges, causeways, and approaches thereto, across the Saint Marys River, from a point in or near the city of Sault Sainte Marie, Michigan, to a point in the Province of Ontario, Canada.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That (a) in order to facilitate international commerce, improve the postal service, and provide for military and other purposes, the State of Michigan, acting through The International Bridge Authority of Michigan, or the successors to said authority, be, and is hereby, authorized to construct, maintain, and operate a bridge, or series of bridges, causeways, and approaches thereto, across the Saint Marys River, so far as the United States has jurisdiction over the waters of such river, from a point suitable to the interests of navigation, in or near the city of Sault Sainte Marie, in the State of Michigan, to a point in the Province of Ontario, Canada, in accordance with the provisions of an Act entitled "An Act to regulate the construction of bridges over navigable waters", approved March 23, 1906, and subject to the conditions and limitations contained in this Act, and subject to the approval of the proper authorities in the Dominion of Canada.

(b) There is hereby conferred upon the State of Michigan and The International Bridge Authority of Michigan, or the successors to said authority, all such rights and powers to enter upon lands and to acquire, condemn, occupy, possess, and use real estate and other property in the State of Michigan needed for the location, construction, operation, and maintenance of such bridge, or series of bridges, causeways, and approaches thereto, as are possessed by railroad corporations for railroad purposes or by bridge corporations, or bridge authorities, or the State of Michigan, for bridge purposes in the State of Michigan, upon making just compensation therefor to be ascertained and paid accoring to the laws of such State, and the proceedings therefor shall be the same as in the condemnation or expropriation of property for public purposes in such State.

(c) The State of Michigan, acting through The International Bridge Authority of Michigan, or the successors to said authority, is hereby authorized to fix and charge tolls for transit over such bridge, or series of bridges, causeways, and approaches thereto, and the rates of toll shall be so fixed and adjusted as to provide a fund sufficient to pay the reasonable cost of maintaining, repairing, and operating such bridge, or series of bridges, causeways, and approaches thereto, and to provide a sinking fund sufficient to amortize the cost of such bridge, or series of bridges, causeways, and approaches thereto, including reasonable interest and financing cost, as soon as possible under reasonable charges, but within a period of not to exceed forty years from the completion thereof. After a sinking fund sufficient for such amortization shall have been so provided, such bridge, or series of bridges, causeways, and approaches thereto, shall thereafter be maintained and operated free of tolls. An accurate record of the cost of such bridge, or series of bridges, causeways, and approaches thereto, the expenditures for maintaining, repairing, and operating the same, and of the daily tolls collected shall be kept and shall be available for the information of all persons interested.

SEC. 2. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Approved, December 16, 1940.

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